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The ELECTRICAL REVIEW

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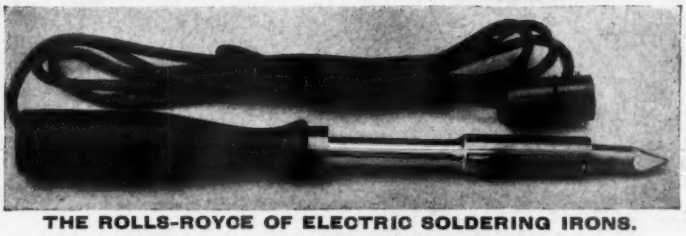

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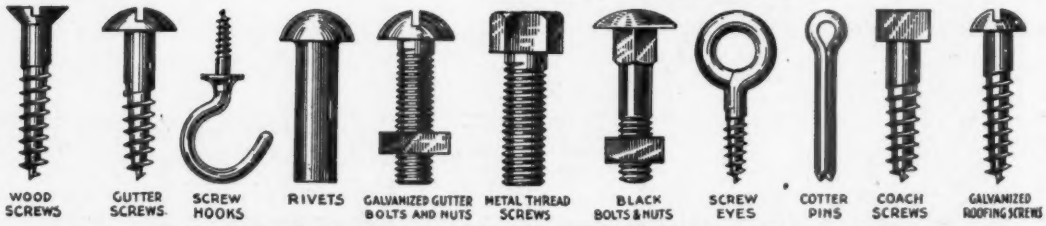

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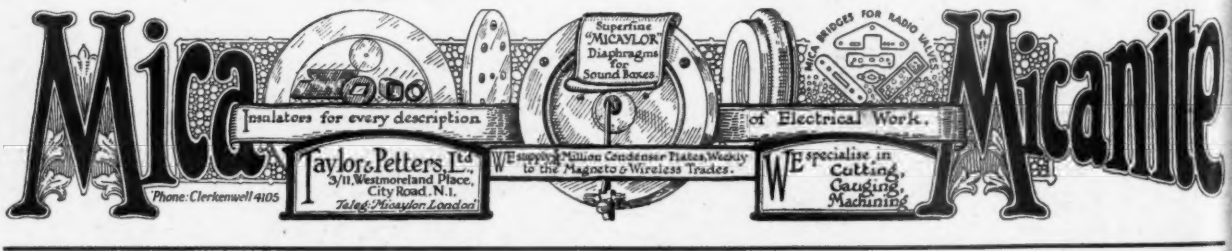
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GUARDS

The
Electrical Review

VOL. CXII. MARCH, 31 1933. No. 2888

THE OLDEST ELECTRICAL PAPER. ESTABLISHED 1872.

Published every FRIDAY, Price 6d.

THE ELECTRICAL REVIEW, 4, LUDGATE HILL, LONDON, E.C.4.

Telegraphic Address: "AGLEKAY, CENT, LONDON." Code, A B C. Telephone No.: Central 5871 (5 lines).

The "Electrical Review" is the recognised medium of the Electrical Trades and has by far the largest Circulation of any Electrical Industrial Paper in Great Britain.

SUBSCRIPTION RATES, Postage Free: United Kingdom, £1 14s. 8d. Canada, £1 12s. 6d. Colonial and Foreign, £2 1s. 6d. per annum. Cheques and Postal Orders (on Chief Office, London) to be made payable to ELECTRICAL REVIEW, LTD., and crossed "Lloyds Bank."

For List of Foreign Agents for the ELECTRICAL REVIEW see Advertisement Supplement.

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Nearing Completion

THE fifth annual report of the Central Electricity Board, issued yesterday, is presumably the last of the series that will deal mainly with constructional work, as it records the little that remains to be done to complete the scheme as a whole. No doubt, relatively minor extensions will be carried out from time to time to meet new developments, probably at 66 kV and less.

The assumption by the Weir Committee that such lines would be supplied by the local undertakings was unwarranted, and the Board, in providing about 1,000 miles of secondary lines, has considerably enhanced its utility in opening up outlying areas. Potentialities in this direction have been increased by the most interesting technical achievement of the year, which has resulted from research initiated by the Board.

This is the 3,000-kVA sub-station for the Galloway hydro-electric scheme, which is connected to the 132-kV transmission line by an isolating switch and fuses at a cost only one-fifth of that of the simplest single-switch grid sub-station.

Interesting as are so many of the technical features of the grid, and valuable as we expect the experience will prove to our manufacturers in the markets of the world, we are glad to arrive at the end of the constructional stage. For one thing, it enables the quietus to be given to fantastic rumours as to the cost of the work. This will be about £27¼ million, which is within 2½ per cent. of the estimates prepared by the Commissioners, allowing for some deviations from the original plans, such as the provision of several experimental sections of 132-kV cable, but taking no credit for the carrying out of the work in six years as against the eight years anticipated in Sir Archibald Page's presidential address to the I.E.E. in 1927.

The Board has also approved more than half the estimated expenditure on frequency standardisation, the amount expended for the purpose at the beginning of the year being £9,000,000. Information is included for the first time on the economic results of "temporary arrangements" for giving advance supplies to avoid the installation of generating sets that would not be required under the grid scheme. Despite rumours to the contrary, a surplus has been made, apart from the saving of heavy obsolescence charges on plant whose useful life would have been very short.

Perhaps the most important of the immediate consequences of the completion of the constructional programme is the different angle from which the Board's activities will be regarded. No longer viewed mainly as a body responsible for running high-voltage overhead lines over the country and for selecting stations for operation, it will be seen for what it really is—an integral part of the supply section of our industry.

In its relations with the national and regional consultative committees we see great possibilities for aiding the development of the uses of electricity. In such effective co-operation, carried out with the goodwill of all concerned, lies the best chance of avoiding further legislation.

E.h.p. Alternators

WHEN the late Sir Charles Parsons and Mr. J. Rosen first advocated the adoption of higher generating voltages before the I.E.E. in 1929, the great majority of those who took part in the discussion were ready with arguments to show why progress could not, or should not, be made along the lines indicated. Even the testimony of Captain J. M. Donaldson to the behaviour of a large 33,000-V turbo-alternator under the severest conditions of service, and his statement as to the important financial savings effected by generating directly at the voltage of transmission failed to disarm the critics. Time, however, and the logic of facts have since done their work. As happened in the case of the steam turbine, the conservatism and prejudice with which the high-voltage alternator had to contend at the outset have had to give way to an appreciation of its merits, and to the realisation of the fact that it constitutes a natural and inevitable development in

power-station practice. There are now in service, or in course of construction, seven steam turbo-alternators, with an aggregate capacity of 168,000 kW, all designed to generate at from 33 to 36 kV. The set recently shipped to Capetown, which is described on another page, is a particularly interesting one in several respects.

Avoiding the Groove

That the danger of over-specialisation is appreciated by many of our younger engineers was evident from the speeches of graduate and student members at this year's dinner of the I.E.E. London Students' Section. The groove can be avoided by obtaining a knowledge of what other workers in the industry are doing, and also what they are like as men. The meetings and functions of the section offer excellent opportunities for both, and the continuance of the present collaboration with the students of the "Civils" and the "Mechanicals" is to be welcomed to the same end.

Railway Electrification

Not the least important part of the speech of Sir Alexander Roger at the annual meeting of British Insulated Cables on Tuesday was his reference to the subject of railway electrification and the reasonableness of the claim of the railway companies to Government assistance to facilitate conversion, thereby taking thousands of men off the "dole." The cost of construction and the interest rate payable have fallen considerably during the past year, and so favourable an opportunity may never recur. Mr. Chamberlain has expressed a sympathetic Governmental attitude in Parliament.

United Effort in Canada

To-morrow the Canadian branches of four well-known British electrical manufacturers begin amalgamated operations as the British Electric Plant Company (Canada), Ltd. As our Canadian Correspondent points out on page 459, they will in future substitute for competition against each other a united front against all others. All the companies interested have had lengthy experience of the market, and they have not lightly entered into this agreement to make a bold bid for increased trade.

Confidence on Tyneside

Electric power companies in the great industrial areas have lately been recording the effect of trade movements upon their 1932 operations. The hopeful attitude of Mr. R. P. Sloan, Chairman of the North Eastern Company, is the result of observation of various national industries. He finds the coal-trade outlook brighter than a year ago, and absolves the colliery companies in his area from the criticism of lack of enterprise, because the more important groups have spent large sums in introducing up-to-date plant, apparatus and methods. Shipbuilding was at its lowest ebb a year ago, and now, as in ship-repairing, there are signs of improvement. Prospects in the iron and steel industries and of the miscellaneous trades are also gratifying. We hope that these indications will eventuate in a substantial addition to the industrial load for 1933. The remarkable progress in the company's domestic business continues, 21,540 such consumers being added last year, an addition which justified Mr. Sloan's congratulations to the department concerned as well as his compliment to E.D.A., whose propaganda work had paved the way for such progress throughout the country.

Depression in Scotland

Mr. George Balfour was not able to adopt the same happy attitude when he spoke of the experiences of the Scottish Power Company, for the industrial depression in that area continued unabated. It is true that certain industries showed a small sign of improvement, but in districts like Dunfermline, Arbroath and Galashiels the textile trade is still very depressed indeed. Only two linen factories continue working in Dunfermline; in Arbroath things are as bad, if not worse, and the tweed industry is struggling for existence. A great search for new business to compensate for the power decrease has been made in the domestic branch, but there was marked disinclination on the part of the public to spend even on desirable services until things generally were better. It is noteworthy that an extensive canvass was made of every newly-connected burgh and village, and a demonstration heating and cooking van toured the scattered villages. The Clyde Valley Power Company experienced continued stagnation in the principal industries of its district, but there have been slightly better signs so far this year.

Lancashire Power Progress

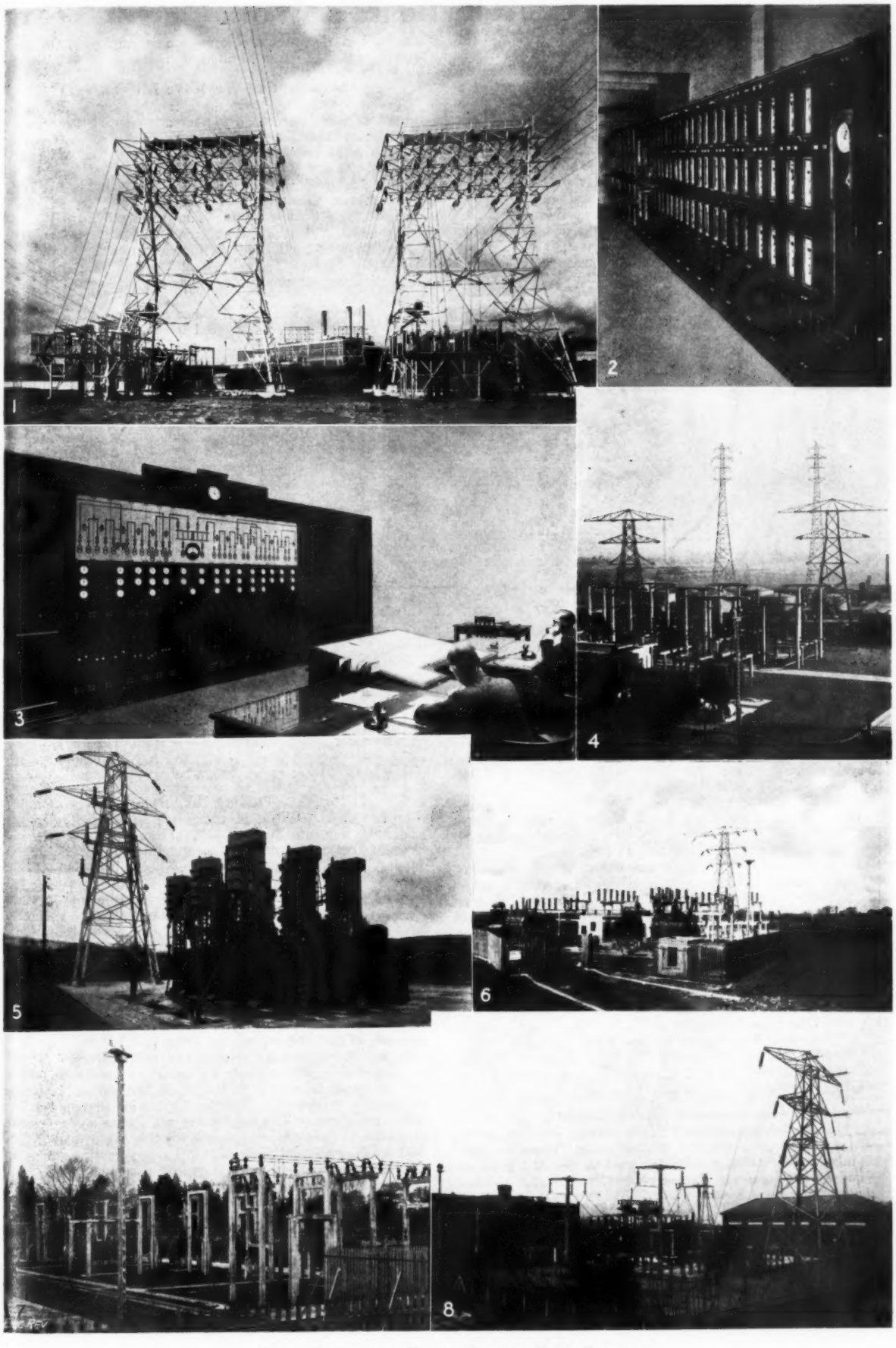
The ups and downs of industry were experienced, too, by the Lancashire Electric Power Company. Mr. Alfred Shepherd told shareholders of the Lancashire Electric Light & Power Company, the parent company, that the industrial improvement of the first half of the year was not maintained in the latter half, which period included strikes in the weaving and spinning sections. Important new consumers, including cotton spinning mills, were connected, and the units sold totalled nearly 21 millions more than for 1931, but this year will show the benefit of the new load provided by the Manchester-Bury railway, which hitherto has had its own generating station, but changed over on March 6th. New districts, chiefly rural in character, were opened up, distributing mains being laid at the rate of 1¼ miles per week; the year's capital expenditure upon distribution was £152,000, out of a total of £155,370. The supply to these districts will take time for full development. Notwithstanding trade conditions and difficulties there was a substantial increase in units sold to the textile trade, indicating a steady continued adoption of electrical methods in the mills. The overall efficiency of the Kearsley station was further improved, the coal consumed per kWh delivered to the mains being 1.36 lb., as against 1.38 lb. for 1931.

Misplaced "Protection"

In our issue of March 3rd, we questioned the need for an organisation to protect consumers against the London and Home Counties Joint Electricity Authority. A contributor to the *Saturday Review* seeks to enlighten us. The test is, as he rightly states, the provision of a cheap and efficient supply of electricity. We certainly hold no brief for "bureaucratic monopoly," but we consider that the J.E.A. has so far fulfilled that test, and we imagine would not object to the insertion of safeguards that it will continue to do so in any agreements made for the purchase of undertakings. If protection is required for the consumer, it is surely against undertakings which hold with the writer of the article, that "to say that electric current can be generated, sold, and distributed for a penny a unit is stuff and nonsense." Many of our most prosperous undertakings are selling electricity for half that amount; when this is a component of a domestic two-part tariff, the fixed charge is usually so calculated as to bring the lighting charge up to an economic overall rate, all the consumption for the larger purposes being sold at the running charge as a net figure.

Controlled Manufacturing?

Readers will be interested in Mr. W. C. Lusk's speech to British Thomson-Houston shareholders, appearing on another page. The measure of control of electricity supply resulting from the grid scheme has led him in imagination to visualise the prevention of excessive production in the electrical manufacturing industry. He asks, in effect, of what avail it would be for concerns to agree to reduce their existing excess productive facilities in the absence of a controlling authority to prevent the creation of new facilities. Mr. Lusk asks for consideration to be given to the idea of setting up a suitable body to co-operate with the leading companies in this matter.



Some Important Points in the Grid System

1. Gantries carrying 66-kV lines at Dunston. 2. Metering equipment at the Barking 132-kV transforming station. 3. Control room at Glasgow. 4. The Portishead sub-station and high crossing towers at Portishead Dock. 5. The Longland (South Scotland) 132-kV switching station. 6. The 132-kV switching station at Fraddon (South-West England). 7. The Nursling switching and transforming station (South-West England). 8. The Stockport switching and transforming station (North-West England).

D

The Central Board's Work

THE fifth annual report of the Central Electricity Board was issued yesterday (Whitehead Morris, Ltd., 5s.).

In this it is stated that by the beginning of this year only 212.5 miles of towers and 3.5 miles of cables, out of a total of 4,000 miles (2,894 primary and 1,106 secondary), were incomplete. All the wayleaves, except for a few miles, mainly in the New Forest area, had been secured; compulsory powers have been obtained in only 600 of the negotiations with 21,000 owners and occupiers of land. Standardisation of frequency was completed in Central Scotland; this involved the replacement of 18,000 motors (300,000 h.p.) and of 200 rotary convertors (over 150,000 kW). The Grampian water power station was operated in conjunction with the selected stations.

In South Scotland seventy-five miles of the transmission lines were in operation and temporary supplies were given to the Kirkcudbright County Council and to the Galloway Water Power Company for the construction of the Glenlee and Tongland hydro-electric stations. In November the first 132-kV outdoor ironclad switchgear yet manufactured was put into operation at Tongland.

Concurrently with the construction of the grid in the North-East England area the first section of the Dunston 50-cycle station (ELECTRICAL REVIEW, February 10th) was put in hand and the North Tees "A" station was changed over from 40 to 50-cycle working. Over 1,700 motors, aggregating about 40,000 h.p., have so far been standardised.

In the North-West England and North Wales area the construction of the Barrow-in-Furness secondary ring and the section between Egremont and Penrith has been postponed until the load conditions necessitate their use. The chief technical feature in this area is the use of barrier joints on the cable through the Mersey Tunnel in order to avoid damage to the lead sheathing due to the hydraulic head on the impregnating compound. In the southern part of the Mid-East England area the grid has made possible the economic development of a purely rural district.

Nine of the nineteen existing selected stations in Central England (aggregating 553,500 kW) were interconnected by 175 miles of line, and 48,750 kW of generating plant was rewound for 50 cycles. At the end of the year about 276,000 h.p. of plant and consumers' equipment had been changed over. The Ironbridge station of the West Midlands J.E.A. (ELECTRICAL REVIEW, September 2nd, 1932) is now interconnected through the grid with Stourport station and with Birmingham via Wolverhampton and Ocker Hill.

Experimental 132-kV Cables

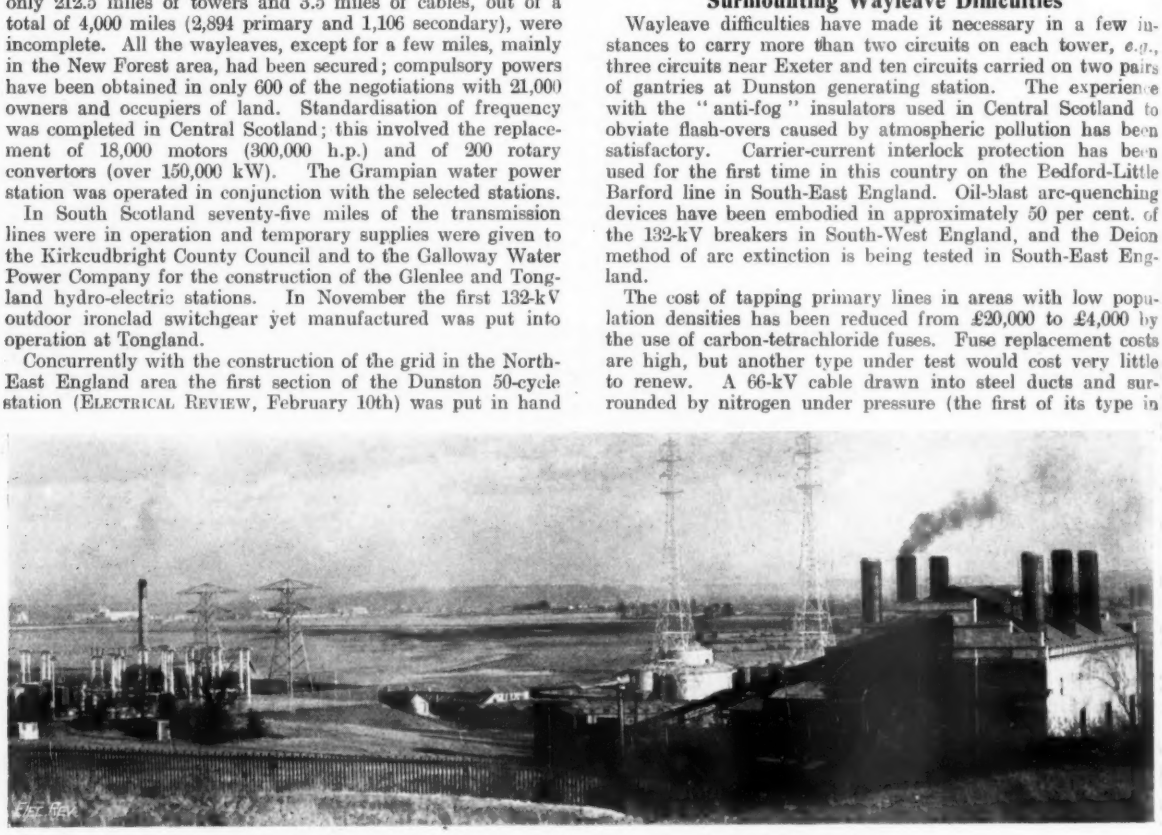
In the South-East and East England areas are the experimental lengths (15.3 miles) of 132-kV cable. There are also 102 miles of lower-voltage cable included in the 324.6 miles of secondary transmission. The erection of the Brighton-Portsmouth primary line has been postponed. There are eight river crossings including that of the Thames with its 487-ft. towers and anchor towers lighted by neon and other lamps with a total candle power of 20,000. The central control building at Bankside has been completed; operation is over G.P.O. circuits to all the selected stations. Supply was made available to the Southern Railway Co., for the Brighton and Worthing extension, by arrangement with the undertakings at Croydon, Three Bridges and Brighton.

Foundation difficulties have caused delay in parts of the South-West England and South Wales area. The "low" type of sub-station with reinforced concrete structures has been used in this area; as the selected stations are widely scattered, five of the primary sub-stations are being erected in combination with lower-voltage sub-stations. At Portsmouth the principal sub-station is some miles from the generating station, and remote-control operation is employed; the connection is carried out with oil-filled cables.

Surmounting Wayleave Difficulties

Wayleave difficulties have made it necessary in a few instances to carry more than two circuits on each tower, *e.g.*, three circuits near Exeter and ten circuits carried on two pairs of gantries at Dunston generating station. The experience with the "anti-fog" insulators used in Central Scotland to obviate flash-overs caused by atmospheric pollution has been satisfactory. Carrier-current interlock protection has been used for the first time in this country on the Bedford-Little Barford line in South-East England. Oil-blast arc-quenching devices have been embodied in approximately 50 per cent. of the 132-kV breakers in South-West England, and the Deion method of arc extinction is being tested in South-East England.

The cost of tapping primary lines in areas with low population densities has been reduced from £20,000 to £4,000 by the use of carbon-tetrachloride fuses. Fuse replacement costs are high, but another type under test would cost very little to renew. A 66-kV cable drawn into steel ducts and surrounded by nitrogen under pressure (the first of its type in commercial service in the world) has been put into use between Hackney and Walthamstow.



The Portishead power station, the grid sub-station and the Dock crossing towers

Trading Begins

In two areas (Central Scotland and Mid-East England) a grid tariff was introduced in collaboration with the National Consultative Committee and normal trading was begun on January 1st (ELECTRICAL REVIEW, November 25th, 1932). Agreement has been reached with the owners of selected stations regarding the formula for ascertaining management expenses, working capital, and accountancy. The tariffs have been made so that receipts shall cover working expenses over a period of ten years. The tariffs are embodied in an appendix, and this section of the report contains a lucid summary of the statutory duties of the Board and the principles governing the control of selected stations of which there are 135 (119 existing). It is computed that the saving in capital expenditure in generating stations and plant during the next decade will be in excess of the total capital cost of the grid.

Among the advantages of the Board's trading cited is that an undertaking will pay only for electricity purchased for resale to consumers and will thus avoid the periodic increases in the cost of production incurred by the installation of additional generating plant that would not immediately become productive. Another benefit mentioned is the availability of bulk supplies in rural areas at prices approximating closely to those hitherto confined to large centres of population.

The maximum amount which the Board is entitled to borrow is £50,000,000; expenditure sanctioned by the Commissioners amounts to £29,250,000 for the grid (including interest and working capital) and £12,674,600 for frequency standardisation. The Board has not applied for a guarantee of capital and interest (as it is statutorily entitled to do) for any of the stocks issued.

Mr. C. D. Taite is chairman and Mr. C. S. Morley New vice-chairman of the National Consultative Committee. The chairmen of the District Committees are: Messrs. E. Seddon (Central Scotland), H. A. Couves (N.E. England), H. C. Lamb (N.W. England and N. Wales), W. B. Woodhouse (M.E. England), J. T. H. Legge (Central England), Dr. S. L. Pearce (S.E. & E. England), and Mr. A. Nichols Moore (S.W. England and S. Wales). The report is well illustrated with photographs of technical interest, some of which are reproduced on page 443.

Ships' Deck Machinery. By R. H. Jackson

The development of the Ward-Leonard system of control

THE application of electricity to deck machinery on board ships has made rapid strides within the last few years.

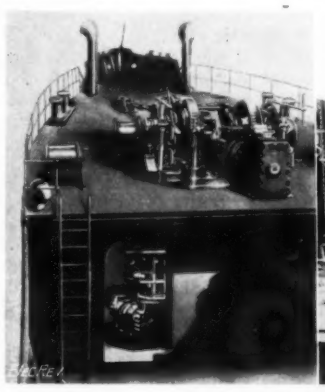
The raising of the anchor, or keeping the strain on the anchor chain while the stopper bars are inserted, would impose a very heavy load on any electric motor ordinarily controlled. Under these circumstances 10 V being quite sufficient to produce full-load current in the motor windings, it is obvious that at 220 V an enormous current would be induced in the windings, which besides putting a heavy load on the ship's generators, would in all probability damage the motor.

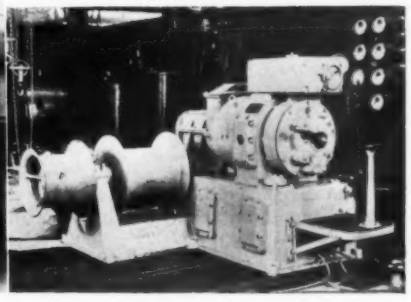
Various methods of overcoming this difficulty have been tried, such as resistance being inserted by the operator. Naturally he is not always able to see his load and in any case must be fairly skilful. Automatic means of inserting resistance have been tried, but this causes the control to be very coarse and in any case is a wasteful energy absorbing device.

The Ward-Leonard system endeavours to obtain smoothness of control without introducing complications. Generally it consists of a motor-generator receiving its energy from the ship's supply and the generator in turn feeding the winch motor. From fig. 2 it will be seen that the generator field also receives its supply, through a regulator, from the ship's mains. The armature of the generator is connected direct to the armature of the winch motor, while the field is fed direct from the ship's mains.

The motor-generator is running constantly while the winch is in use. Until the generator field is excited, however, no current is supplied to the winch motor armature. It therefore remains stationary. When the handle of the regulator is moved on the first step a small current flows through the generator field. The generator now supplies a small current to the winch motor and the armature revolves slowly. As the resistance of the regulator is cut out, the speed of the winch motor increases.

It will readily be seen that when the regulator handle is moved in the opposite direction, the polarity of the generator field is reversed and so the winch motor revolves in the opposite direction.





A view showing a windlass and controller on deck with motor generator and starting switchgear below; and (right) a booster controlled warping winch as supplied to the *Britannic* and *Georgic*

The Ward-Leonard system of control has been still further developed by Messrs. Clarke Chapman & Co., Ltd., and has culminated in the Ward-Leonard booster system of control. This system has been successfully applied to deck machinery on the all-electric vessels *Strathnaver*, *Strathaird*, and the *Monarch of Bermuda*, while the *Queen of Bermuda*, at present undergoing trials, is being fitted with deck machinery of this type. Fig. 3 shows the circuit of a booster-controlled capstan.

Operation of the System

A start push is usually fitted on, or near, the main controller, which starts the motor booster through automatic switchgear.

The booster generates a negative voltage of about 20 V less than that of the ship's supply. No current can pass through the main motor armature, however, until the controller is moved on to the first step and switch A is closed. When the controller is moved to the first step switch A is automatically closed and current flows through the main motor armature. The pressure being only about 20 V, the armature revolves slowly. The ohmic drop being very small, a large torque may be produced at this low speed.

Putting the controller on the second step, resistance is added to the separately excited shunt field and the voltage across it falls. Consequently the generated negative voltage falls and, being in opposition to that of the line, the voltage on the main motor armature rises and the motor speeds up.

The series field of the generator opposes the two shunt fields and is in series with the main motor circuit, so that any increase in load on the main motor causes the generated voltage to be lowered still further.

When the controller is passed to the third step the separately excited shunt field is cut out. The voltage of the generator now depends on the strength of the self-excited shunt field, which, in turn, depends on the series field. In the event of a heavy load being applied on this step, the greater current flowing through the series field will cause the negative voltage generated to be increased, which, in turn, increases the strength of the self-excited shunt. The negative voltage generated, the fields being of sufficient strength according to the load, may be sufficient to allow the main motor to stall.

On steps 4, 5, 6 and 7 the separately excited shunt is excited

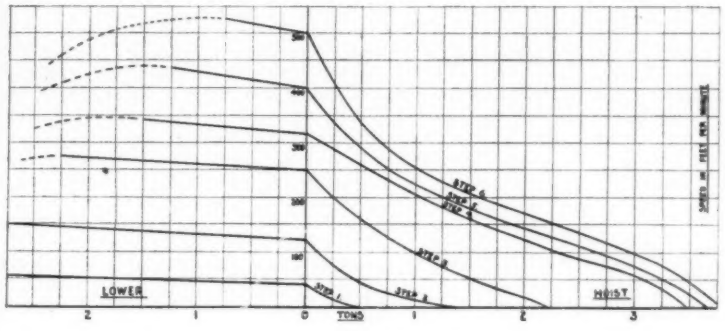


Fig. 1

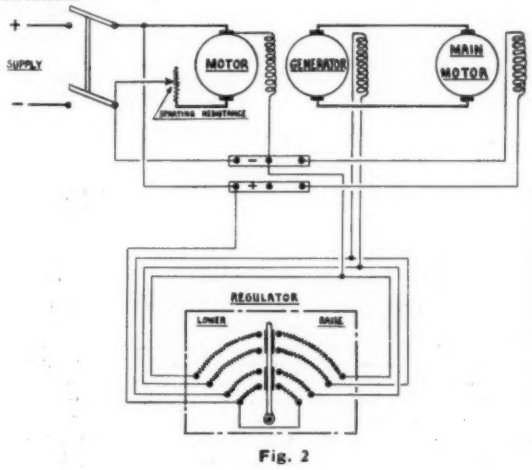


Fig. 2

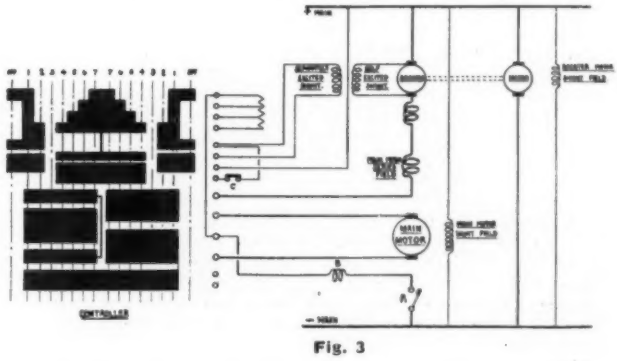


Fig. 3

in the opposite direction with various values of resistance cut out, respectively. As the field is reversed the generator voltage is reversed, and on light loads it becomes a positive booster. It therefore adds its voltage to that of the line and increases the voltage on the main motor.

A torque limiting device in the form of a relay may be fitted, as shown at B, fig. 3. This may be set to come into operation at any desired value of overload. When called upon the relay opens the contacts at C, which produces the same effect as the controller being on the third step.

A performance curve is shown in fig. 1, being plotted from test results of a Clarke Chapman 2-ton booster-controlled winch. It will be noticed that the system gives regenerative braking on the lowering side and allows for considerable current being returned to the line, together with a great saving in mechanical brakes.

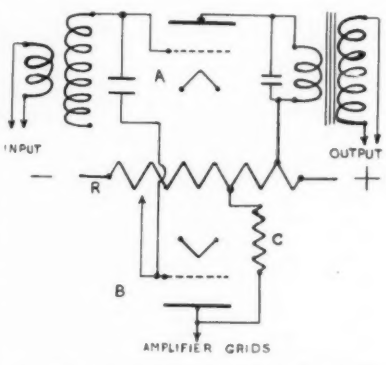
Automatic Volume Control. By R. W. Minter

THE frequency band used for normal broadcast telephony is, unfortunately, rather more subject to periodic signal fading and surging than any other section of the frequency band employed for radio communication. Automatic volume control, the practical development of which dates from about 1924, can overcome this phenomenon to a large extent. Receivers so controlled have been on the market in the United States for several years, but only recently have sets constructed in this country incorporated this method of sensitivity control.

When the potential of the grid of a valve is changed its characteristics are altered so that it passes more or less current in its plate-filament circuit, depending upon whether the grid is more or less negative with respect to the filament. When bias on the grid increases in a negative sense, anode current decreases. If, then, we so arrange a controlling device in a receiver that when audio output changes the characteristics of the amplifying valves are altered, the amplifier sensitivity will change inversely with the audio output, and the tone level will be kept approximately constant, in spite of fading and surging of signals due to changes in the height of the Heaviside layer, or to other factors affecting radiation.

The Principle Illustrated

The diagram illustrates the fundamental principle of this device: A is the rectifier, B the automatic volume control valve, and R the potential dividing system of the receiver. The grid of the rectifier is connected through a condenser to the grid of the control valve and, therefore, when there is any change of potential on the grid of the rectifying valve, there is a corresponding change in the bias of the control valve grid. This change in grid potential alters the characteristic of the a.v.c. valve, so that the CR drop across the resistance C varies and this, in turn, changes the bias on the amplifier valves to which it is connected. The amplifier is therefore made to change its sensitivity inversely as the audio output changes and so the level of sound output is kept approximately constant.



For instance, if there is a surge of signals, the rectifier grid potential increases, the control valve grid becomes more positive, and more current flows in its plate circuit. The CR drop across C is thus caused to increase, imparting more negative bias to the grids of the amplifying valves, with the result that the amplifier becomes less sensitive and the input to the rectifier decreases. Conversely, if there is fading, the rectifier grid potential swing decreases, so that the control valve grid becomes more negative and less current flows in its plate-filament circuit, with the result that the CR drop in C decreases and the amplifying valves have their characteristics moved more into the region of positive grid potential and thus become more sensitive, thereby sustaining the input to the rectifier.

In addition, it will be seen from the figure that the grid of the a.v.c. valve is connected to the potential dividing system by means of a sliding contact, so that its potential with respect to its filament may be varied at will. In this way it is possible to make the automatic control valve operate in conjunction with the manual volume control, which, now that it is joined to the grid of this valve, sets its characteristic to any desired value, thereby automatically retaining the output from the rectifier at any desired level, since the change of bias put upon the grid of the control valve is communicated to the grid of the rectifier to which it is connected.

There are other ways in which the bias of the amplifying valves may be varied automatically in order to change their characteristics and thus to control the input to the rectifier. Control could be effected from the plate circuit of the rectifier instead of from the grid, or a suitable resistance could join the grids of the rectifier and amplifier together, thus obviating the use of an extra valve. Also, if the valves in use are of the screen-grid type, control could be effected either from the screen or from the cathode of the rectifier. If a resistance is used direct from grid to grid, or in the plate circuit of the controlling valve as illustrated, its time constant must be kept large enough to prevent the receiver responding to changes in modulation of the carrier of the signal being received. It is not necessary to provide for highly flexible control, since short-time fading on the broadcast band rarely exceeds 1/20th of a second in rapidity and quite often not 1/10th of a second, so that if the time constant of the biasing resistance is kept between these limits, there will be no fear of the colour of the transmissions being suppressed. Over-control must also be avoided, owing to the rise in noise level which would result.

The advantages to be derived from the use of automatic volume control are that fading and surging are largely eliminated, so long as the field strength at the receiver remains above the limit necessary to operate the amplifier and that the rectifier and a.v.c. valves retain their linear characteristics well above the range of audio output of the receiver. The tuning of the set may also be changed from one station to another without there occurring much change in audio output for the same setting of the manual volume control, although it is not to be expected that wide variations will not be observed just the same, owing to the varying distances and field strengths of the different stations which it is possible to receive.

Certain Disadvantages

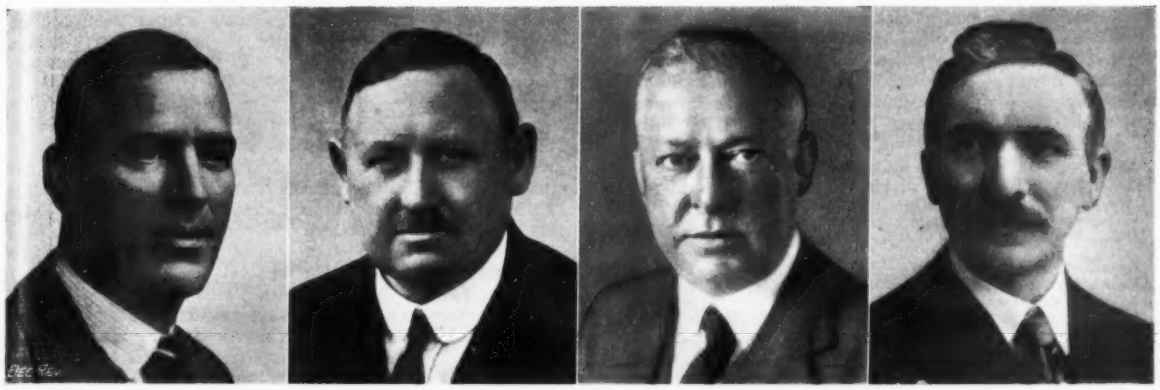
On the other hand, there are a number of disadvantages attached to receivers of this kind. The whistle produced in superheterodynes in the ordinary way between the beats on the desired and unwanted signals is much accentuated, due to the increase in sensitivity imparted by the automatic control, which is at a maximum between signal channels, where the whistle is most prominent. The average noise level is much higher than under ordinary circumstances, although severe atmospherics are smoothed out by the control, whilst any defects in the receivers themselves, such as imperfect resistance units, will soon indicate their presence by heavy crackling and scraping, rather like bad atmospheric disturbances. Tuning requires much more care, owing to the heavy increase in noise level which accompanies any shift from resonance and so soon as signals begin to decrease as a consequence. A visible tuning aid, such as a milliammeter connected in the anode circuits of the amplifier, is therefore a great advantage in this respect, as it is easier to tune to proper resonance visually than aurally. Resonance is, of course, indicated when the meter reading is the lowest possible for any particular station.

Automatic volume control can be adapted to any type of receiver and, although it calls for more intelligent use, its advantages, in a general way, considerably outweigh the difficulties which it produces, except in localities where there is much "man-made static," for the owner of such a receiver can adjust any programme to his liking, retire to the other end of the room, and forget the set altogether.

Some Safety Rules

AT the forthcoming National Safety Congress "Electricity and its Safe Use in Everyday Life" is to be the subject of a talk by Mr. A. C. Cramb (Director, E.D.A.). Miss C. Haslett, C.B.E. (Director, E.A.W.) is chairman of the National Home Safety Committee of the Safety First Association, which is giving consideration to the need for the intelligent use of electrical apparatus in the home. She has given the following hints for housewives: (1) Do not use portable appliances such as bowl fires or metal dryers in the bathroom; (2) see that the apparatus in your bathroom is properly earthed; (3) do not touch switches, electric irons, &c., with damp hands, and particularly not from the bath; (4) do not allow cords to "kink"; and never wipe them with a damp cloth; (5) switch off the current when not using (even temporarily) an iron, toaster, or cleaner; (6) understand your electrical installation, but call in an expert if in difficulty.

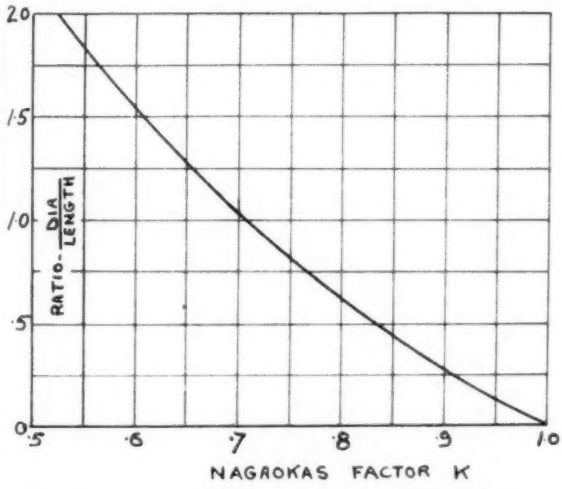
Some Driving Forces in the Industry: Davidson & Co., Ltd.



1. Mr. A. Brown (*Abernethy*), technical director. 2. Mr. A. A. Agar, chairman and managing director. 3. Mr. J. W. Gibson (*Int. Rotogravure*), London director and director of sales. 4. Mr. H. T. Coulter, commercial director.

Choke Coil Design

CHOKE coils are used at the termination of an overhead line to protect the adjacent apparatus from lightning and switching surges, and to enable lightning arrestors to operate. A surge of high frequency or steep wave front travelling along



a line and reaching an inductive winding will build up a high voltage between the end turns and to earth. The end turns of power transformers usually have more insulation to assist them to withstand these surges, the voltage of which may be higher than normal by the addition of the reflected voltage. The use of a choke coil situated between the line and transformer will prevent the brunt of the surge reaching the transformer. The point of placing the choke coil is the best for connecting the lightning arrestors. The coil builds up the voltage momentarily at the line end of the coil and assists the arrestor to discharge and relieve the surge.

The coil must be chosen with due regard to the system, for a coil of small inductance has a low protective power, while a very large coil may upset the line regulation due to the excessive reactance. The current rating must be suitable for the normal load current. Typical coils for circuits up to 400 A at 15,000 V have ten turns wound on a 3-in. mandrel. Chokes for use up to 70 kV either indoor or outdoor and mounted on post insulators may be nine inches in diameter with twelve turns, or fifteen inches with twelve or twenty turns, the ratios of the different inductances being 1 to 2.4 and 4.5.

Suspension type coils are very convenient for use when inserted in the run of the conductor, a porcelain or wood insulator being used to take the strain; a typical one would have thirty turns with a coil diameter of fifteen inches. Substantial bracing is needed with all choke coils to prevent damage and distortion due to heavy current surges. Their open ends should be covered with fine mesh wire netting.

The inductance of a coil may be calculated from the formula: $L = 0.0395\ a^2\ t^2\ l\ K$, in which L = inductance in microhenries, a = radius of coil in cm., t = turns per cm., l = length of coil in cm., and K = Nagaoka's factor (see accompanying graph).

H. E. HUTTER.

Rapid Water Boilers for Domestic Service

ONE of the most useful and commonly employed domestic electrical appliances is the self-contained kettle or boiling jug, for capacities up to three or four pints, which is generally rated at about 600 W. About 22½ min. is required to boil 3½ pints in such a utensil at 600 W, corresponding to an efficiency of about 84 per cent. More rapid boiling can be obtained on a hotplate, preferably using a vessel built specially for this purpose. On hot plates of 800, 1,200 and 1,800 W, 3½ pints of water can thus be boiled in about 20, 16½ and 13½ min. respectively, corresponding to thermal efficiencies of 69, 56 and 44 per cent. These figures, says E. Junck in *Elecktrotechnische Zeitschrift*, show the disadvantage of using hot plates simply for the rapid boiling of water; the heat-storage capacity of the hot plate itself is imperfectly utilised in such cases and waste occurs.

The " express " water boiler

The so-called " express boiler " shown in the accompanying illustration, with an integral " Prometheus " heater built for consumptions of 1,200 and 1,800 W at 220 V, boils, it is claimed, 3½ pints in 11½ and 7½ min. respectively with efficiencies of 82.5 and 80 per cent. The directly heated bottom of the utensil has an area of about 23.2 sq. in., corresponding to loadings of 52 and 77.5 W per sq. in. for the 1,200 and 1,800-W ratings respectively. In boiling 1½ pints of water from 20 deg. C., the 1,200-W express boiler saves 37 per cent. in time and energy consumption compared with a 1,200-W hotplate; and the 1,800 W express boiler saves 55 per cent. in time and energy consumption compared with an 1,800 W hotplate. Compared with a 600-W self-contained boiling utensil, the 1,200-W express utensil saves 50 per cent., and the 1,800-W utensil 66 per cent. in the time required to boil 1½ pints; the energy consumption is the same in these three cases, viz., 600 W×13 min. = 1,200 W×6.5 min. = 1,800 W ×4.3 min. = 130 Wh. The success of the express boiler is attributed to the high specific loading of the heating element, which reduces to a minimum the thermal loss in heating up the mass of the utensil itself. It is technically possible to go still further in this direction by loading a 3½-pint utensil to 2,200 W, or about 95 W per sq. in., but the corresponding consumption of 10 A at 220 V involves obvious objections from the standpoint of installation.

Small Geared Motor Production

IN the works of Klaxon, Ltd., at Birmingham, a ¼-h.p. motor is considered a large machine and production costs are measured in terms of $\frac{1}{100}$ths of a penny. Until a few years ago the primary object of the company was the manufacture of warning apparatus. This still forms the bulk of the output, but the company is definitely out to cater for the small-motor business, and is already producing the driving units for all domestic purposes, for window opening, turntables, temperature-control apparatus, horns, and screen wipers. Success has been achieved not so much by the production of motors and gears but in their combination as correctly designed units.

Above, a large turntable capable of carrying up to 5 cwt.; universal motor with a 2,400 to 1 reduction. Below, a geared-motor unit for operating heating installation valves

Mr. Cook, the works manager, told us that about 80 per cent. of the small-motor driving units called for have reduction gears.

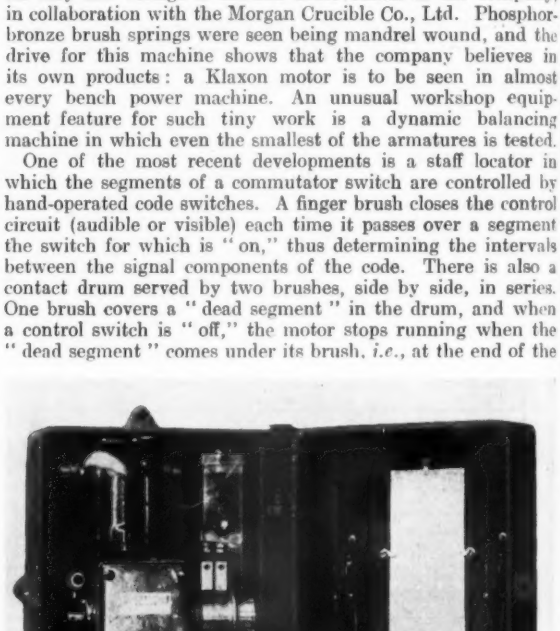
Apart from the castings, the organisation controls the whole of the product. Power presses were seen producing from heavy-gauge sheet metal motor body cups up to about 4 in. deep and 4 in. diameter. Heat-treatment equipment includes a Wild-Barfield furnace for dealing with springs. The company claims to produce diaphragms for Klaxon horns without buckling. Among some fine examples of equipment we saw one lathe machining cast iron at 600 ft. per min. In the production of worm gearing the two essential objects are efficiency and silence, and these cannot be realised in full by any method under which the hob approaches the worm radially. We saw a machine in which the hob approaches the worm tangentially in exactly the manner of engagement in normal operation. Modern automatic machine tools are employed for many purposes, including the production of spindles for motors and small reduction gears. A 500-V motor for operating a tramway screen wiper has a casting of not more than about 4 in. square.

Most of the work in the electrical section is hand winding and assembly. It is often said that great accuracy in the rating of very small motors is not essential, but Mr. Cook assured us that a couple of turns is worth saving, and that $\frac{1}{32}$in. on the diameter of the stampings means a lot of money. High-speed fine-wire armatures, such as are used for drilling machines, are much more difficult to assemble than those with heavier conductors, and the coils are bound in position by tape.

All low-pressure armatures (up to, say, 24V) are passed through a tube wound externally with an element and covered with asbestos before being varnish dipped. This "home-made" but efficient apparatus has done good work for many years. The company claims to have been the first to introduce moulded commutators. In some cases the commutator "shells" are pressed from copper tube, and then moulded on to the spindles before the segments are cut.

In the past the breaking of the leads from the coils to the segments has presented a serious problem, but now very heavy leads are used, resulting, incidentally, in four times the production cost. Commutator brushes for successful operation on very low voltage is another achievement of the company, in collaboration with the Morgan Crucible Co., Ltd. Phosphor-bronze brush springs were seen being mandrel wound, and the drive for this machine shows that the company believes in its own products: a Klaxon motor is to be seen in almost every bench power machine. An unusual workshop equipment feature for such tiny work is a dynamic balancing machine in which even the smallest of the armatures is tested.

One of the most recent developments is a staff locator in which the segments of a commutator switch are controlled by hand-operated code switches. A finger brush closes the control circuit (audible or visible) each time it passes over a segment the switch for which is "on," thus determining the intervals between the signal components of the code. There is also a contact drum served by two brushes, side by side, in series. One brush covers a "dead segment" in the drum, and when a control switch is "off," the motor stops running when the "dead segment" comes under its brush, *i.e.*, at the end of the cycle. An emergency switch cuts out the code apparatus and operates all the alarms continuously. A relay works in conjunction with the apparatus proper and operates the local (alarm) circuit, and any number of relays, and hence local circuits may be arranged in parallel.



A Klaxon staff locator: contactor drum and commutator switch in main housing, left; code switches in cover, right

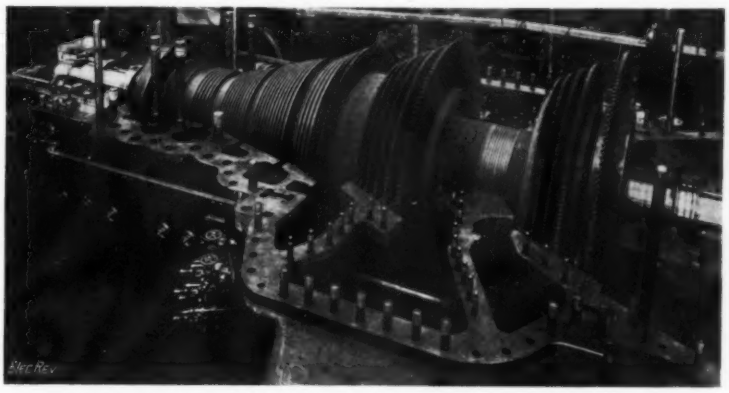
Radium Compared with X-rays for Engineering Testing

IN a paper which Mr. V. E. Pullin, director of radiological research, Woolwich Arsenal, recently read before the Institution of Mechanical Engineers in London, the distintegration theory relating to radioactive materials is outlined, and the relative wavelengths of various components of the so-called electromagnetic spectrum, used roughly to indicate their penetrating power, are given. The method of preparing radon is described, as it has the great advantage that its use would afford an approximation to a point source of radiation. When employing one of the radium salts, the radium must be removed an appreciable distance from the sensitised film to obtain good definition, thus increasing the exposure time. Careful directions are given for the safe handling and storage of the element. The exposure camera in use in the Research Department, Woolwich, is described and curves are given indicating safe working distances for operators. Many experimental refinements making for clear radiography are mentioned. In the case of X-rays the effect of scattered radiation militates seriously against good results, whereas in gamma-ray photography there is practically no such harmful effect. Hence heavy irregular specimens may be radiographed by radium in perhaps one exposure.

Exposure curves for radium, based upon experimental data obtained in the author's laboratory, are given. Owing to the general employment of photographic intensifying screens to shorten exposures, it is not possible to rely on calculations based on the inverse square law. X-rays have advantages for examining metal structures up to 3 in. in thickness, but radium may be used up to 8 in. or more. The use of radium has a very definite future, but its applications are limited. The technique is sufficiently advanced to be available in a practical way, and when skilfully applied to suitable problems will yield results of very great value. Undue optimism regarding these new methods is undesirable, but hasty condemnation is worse. Radium has unique value for the examination of heavy engineering structures suspected of dangerous flaws, while X-rays still retain an unquestionable advantage for the examination of engineering structures up to 3 in. or so in thickness.

Capetown's 33-kV Turbo-alternator

THERE are now in service, or in course of construction, seven Parsons turbo-alternators, with an aggregate capacity of 168,000 kW, all designed to work at from 33,000 to 36,000 V, five of these machines having been ordered within the last thirteen months. The first turbo-alternator in the world to generate at so high a pressure was a 25,000-kW machine supplied by Messrs. C. A. Parsons & Co., Ltd., to the Brimsdown station of the North Metropolitan Co., which was put into service in 1928. Prior to that date one or two machines had been built for 22,000 V and this had been the highest generating voltage attained. A similar unit was supplied last year for the same station. About a year ago the Electricity Commissioners of South Africa decided to secure the advantages of generating directly at the transmission voltage by installing a 33,000-V turbo-generator in the Salt River power station, Cape Town. This 22,000-kW unit has recently been delivered by Messrs. C. A. Parsons & Co., who have since received an order for a second unit of the same capacity and voltage for the same station.



The single-cylinder turbine, with duplex exhaust, opened for inspection

The turbines are designed to take steam at 400 lb. gauge pressure, superheated to 725 deg. F. at the stop valve, and to exhaust into a condenser-vacuum of 28.8 in. with the barometer at 30 in. They are of the single-cylinder type, with a maximum rated output of 20,000 kW at 3,000 r.p.m. To develop this power efficiently in a single cylinder at this speed involves the problem of obtaining a sufficient area for the flow of the steam through the low-pressure end of the turbine without an undue increase in blade-lengths and velocities. The solution adopted by Messrs. Parsons is to duplicate the last few rows of low-pressure blading. On reaching this part of the turbine the steam-flow is divided and passes through the two sets of low-pressure blading in parallel, being re-united in the single exhaust branch before entering the condenser.

Construction of the Turbine

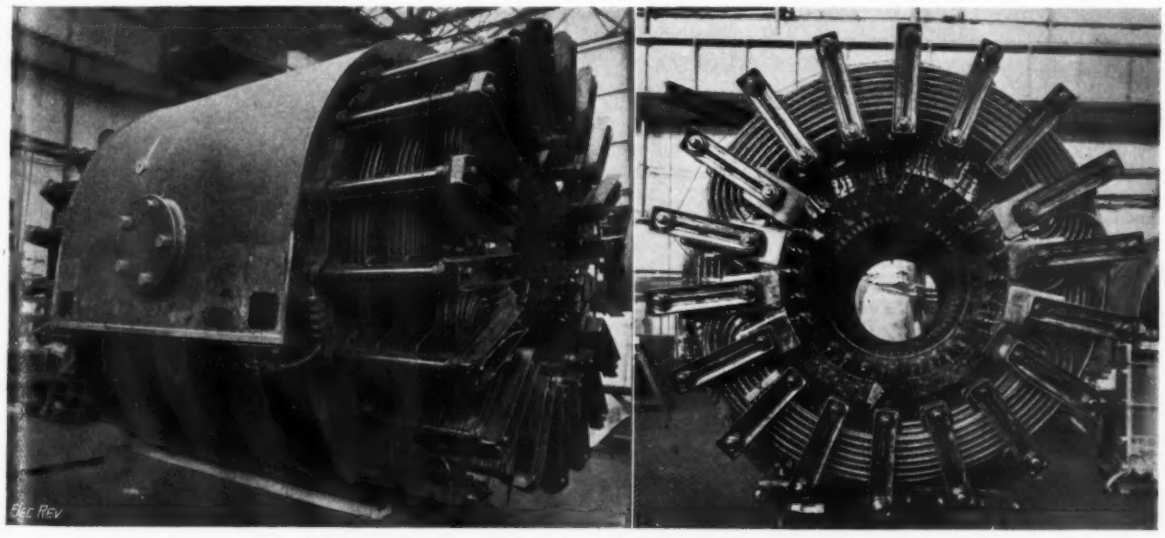
The turbine contains forty-four pairs of blade-rings and to enable the maximum load of 20,000 kW to be carried the first six pairs are by-passed. Except at the low-pressure end, the blading is of the "end-tightened" type, which allows of any desired clearance over the blade-tips without permitting any sensible leakage of steam from row to row. The last rows of moving blades are fitted with anti-erosion shields. The condenser is of the two-pass type with tubes of 0.75 in. external diameter, the total cooling surface being 22,000 sq. ft. The condensate, after recuperating the heat in the steam used to operate the air-ejector, is progressively raised to a temperature of 240 deg. F. by steam tapped from the turbine at two points. The turbine was completely erected at the Heaton works before shipment and run up to an overspeed of 20 per cent.

The Stator Winding

The alternator has a continuous maximum rating of 25,000 kVA at a speed of 3,000 r.p.m., three-phase, 50 cycles, 33,000 to 35,000 V between phases. The stator is wound on the concentric conductor principle, which enables the required voltage to be generated without involving either higher insulation stresses, or greater individual thicknesses of insulation, than are employed in ordinary 11,000-V machines. The fully-wound rotor was run at 40 per cent. overspeed before shipment. At this speed the ordinary centrifugal forces are just about doubled.

The stator casing is of welded steel construction, divided into compartments alternately for the entering and leaving air. This principle permits of the uniform cooling of the machine throughout, no matter what the length of the rotor may be. The exciter, slip-rings, and ventilating fan motor are included in the enclosed ventilating system. The ventilating air is withdrawn from the main air circuit at the entrance to the alternator and returned to the system again after any dust which may have been produced by the brushes has been removed by means of a viscous air-filter. The end-shields are made of a fibrous non-conducting material, with the result that all losses due to eddy-currents arising from the proximity of the rotating magnetic field are avoided. They are much lighter than metallic shields and as they can be attached to the stator by studs and thus held against vibration, the result is quieter running.

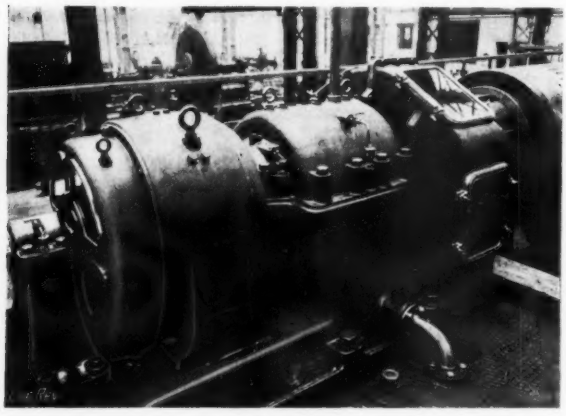
Before being inserted in the stator, every conductor-bar was tested at 100,000, 67,000, and 34,000 V applied respectively between the bull, inner, and outer conductor and earth. When the stator was completely wound 67,000, 45,000, and 23,000 V were applied simultaneously to the respective conductors. Under the latter conditions the windings supported a voltage equal to that which would be developed in an alternator working at not less than 116,000 V between phases. The insulation resistance was measured before and after these tests, to ensure that no deterioration had occurred. Under normal conditions of working, that is, when the machine is generating current at 33,000 V between phases, the difference of potential between the outer elements of the concentric conductors and earth is only 6,400 V, so that the insulation is



The wound stator without end shields; (right) an end view

not called upon to withstand any greater stress than in ordinary practice.

On the test beds at the Heaton works tests were first made to determine the open-circuit and short-circuit characteristics of the alternator. It was then run for several hours at normal speed, on open circuit, excited to 33,000 V. The pressure was then raised to 37,000 V and the run continued for another hour at this voltage. During this open-circuit test the temperature of every part was kept under constant observation. The temperature rise of the machine under full load conditions was arrived at by running it on a three-phase short-circuit with



The totally enclosed exciter and slip rings in the ventilating air circuit

full-load current circulating in the windings of the stator. The insulation resistance was again measured before and after these tests and found to be perfectly satisfactory. The temperature rises were also well within the approved limits.

The alternator was subjected to repeated short-circuits across its terminals before it left the works. These tests, which were witnessed on behalf of the customers by a representative of Messrs. Merz & McLellan, were carried out with the machine running at full speed and excited to 16,500 and 33,000 V. After every short-circuit test the windings of the machine were thoroughly examined for any sign of movement, but none could be detected. The reactance of the alternator was found by calculation to be approximately 22.5 per cent. at 33,000 V, or about the same as that of an ordinary low-voltage machine together with its step-up transformer. Hence the proportionate rush of current due to a short-circuit is no greater in one case than in the other. It is also fairly certain that the ability of a high-voltage alternator with concentric windings to resist the effect of short-circuits or surges due to lightning or other causes, is inherently greater than that of a low-voltage alternator and transformer in combination.

Oscillograph records obtained of the voltage and current under various conditions showed that the voltage curve was of excellent form and free from ripples. The use of alternators generating directly at the transmission voltage ensures the pure wave form being impressed on the transmission system.

It is in accordance with an honourable tradition that the high-voltage turbo-alternator should have been originated by the firm which first provided the electrical industry with the turbo-dynamo, the single-phase turbo-generator, and the three-phase turbo-generator, not to mention the steam turbine itself. In addition to the Brimsdown and Salt River machines already mentioned, Treforest will shortly have an 18,000-kW high-voltage turbo-alternator in service and Swansea two units of 30,000 kW each. One high-voltage machine has also been built by a Continental firm, but it is not yet in operation. Its existence, however, shows that the advantages of generating at the pressure of transmission, with the avoidance of the expense and losses occasioned by the use of step-up transformers, have been appreciated abroad as well as in Great Britain.

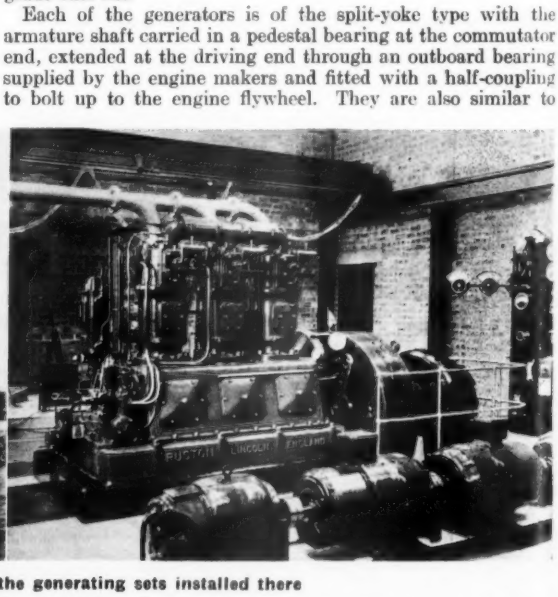
The Stornoway Electricity Scheme

STORNOWAY, the most westerly town in Great Britain, was the birthplace of Sir Alexander MacKenzie, who discovered the MacKenzie River (the greatest river in Canada) and was the first white man to cross the "Rockies" to the Pacific. A less enviable distinction is that until the present winter Stornoway was without a public supply of electricity, but full justification for the new enterprise is found in rapid connection of consumers which has necessitated the institution of a second generating set which has just been put in load. Stornoway is the chief town of the Outer Hebrides, and its normal population of about 4,000 is approximately doubled during the herring season in May and June.

Last year a number of business men in the town decided to introduce electricity and formed a private company. It was decided to take advantage of the experience of an existing organisation, and the Elgin Electric Supply Co. was entrusted with the complete scheme, one feature of the plan being that electricity was to be available for the winter of 1932-33. The scheme was prepared by Mr. A. MacKinnon, the engineer and manager of the Elgin Co., and supply was switched on at the power house by Mrs. N. MacIver, the wife of the chairman of directors, in September last.

The power house is of steel with brick infilling and harled, and consists of an engine room, battery room, workshop, stores and offices. The first generating set installed was a three-cylinder four-cycle vertical crude-oil engine of 112 b.h.p. by Ruston & Hornsby, Ltd., direct coupled to a 75-kW Mather & Platt generator. The second set consists of a four-cylinder 150-b.h.p. vertical crude-oil Ruston & Hornsby engine, direct coupled to a 100-kW Mather & Platt generator. The engines are of the type which has been for many years in commission at the Elgin power station. They incorporate the Ruston principle of airless injection, starting from cold and using low grade fuel-oils.

Each of the generators is of the split-yoke type with the armature shaft carried in a pedestal bearing at the commutator end, extended at the driving end through an outboard bearing supplied by the engine makers and fitted with a half-coupling to bolt up to the engine flywheel. They are also similar to those at Elgin. Alongside one of the generating sets is installed a Mather & Platt booster-balancer set.

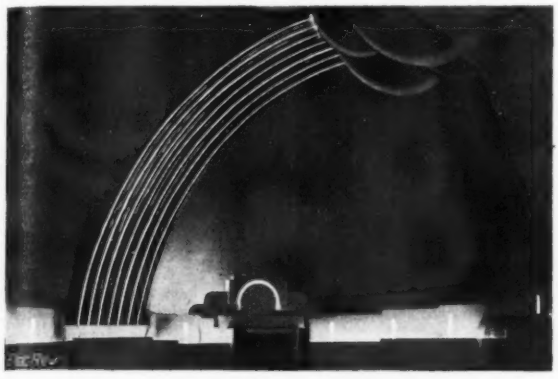


The Stornoway power house and one of the generating sets installed there

The main switchboard, by Messrs. Erskine Heap & Co., Ltd., consists of six enamelled slate panels to control the two generators, two boosters, the balancer set and feeder circuit. The storage battery was supplied by Pritchett & Gold and E.P.S. Co., Ltd., and consists of 256 type "N.C.Y." plate cells having a capacity of 300 Ah at the 10-hour rate of discharge. Distribution is carried out underground. The main contractors for the cables, feeder-pillars, etc., were W. T. Henley's Telegraph Works Co., Ltd.

Electricity at the Ideal Home Exhibition

THE *Daily Mail* Ideal Home Exhibition at Olympia was opened on Wednesday. It remains open until April 29th. Lighting apart, there is probably more new equipment to be seen in connection with refrigeration than with any other electrical equipment at this year's exhibition. The provision of legs and placing the compressor unit at the top of the refrigerator are among the more important changes in the new models by Marco Refrigerators, Ltd. The top compressor unit is also a feature of the new " Prestcold " refrigerators of



The neon " rainbow " at Olympia

the Pressed Steel Co., of Great Britain, Ltd., and, of course, it always has been of the equipment of International Refrigerator Co., Ltd. But greater interest lies in the introduction by the last-named company of the first of its British-made machines which are being produced at Rugby (B.T.-H.). There is no change in operation principle, construction or finish, and no increase in price. Among a few improvements is the stainless steel evaporator.

Electrolux, Ltd., has introduced another air-cooled model, capacity 2 cu. ft. The " Vactric " (Vactric, Ltd.), is again to be seen, and a 1933 " Crypto " (Lancashire Dynamo & Crypto, Ltd.). An important development in new Frigidaire models is a new heat insulation, " Stataflex." A 2-in. wall of this is claimed to be as effective as 3½ in. of other insulation materials. The result is that the food storage capacity has been increased considerably. A sliding egg rack, telescopic sliding shelves, rubber shelf supports, one-piece cooling unit, and the maintenance of refrigeration during defrosting are outstanding features of new equipment by Kelvinator, Ltd.

There are a few new vacuum cleaners, including the " Brownie " and the " Goblin Marvel " (British Vacuum Cleaner & Engineering Co., Ltd.). The former is an addition to the company's cylindrical models, and the latter is of the " broom " type with its internal bag and motor in a casing in line with the handle. The Hotpoint Electric Appliance Co., Ltd., has a new " Junior " at the same price, with the same basis of design. The nozzle has been lengthened by one inch, the wheels are now at the back of the nozzle, the nozzle is surrounded by a fat rubber bumper, and the fixed castor is replaced by a swivelling one at the back. Hoover, Ltd., the Hurley Machine Company (England), Ltd. (" Thor "), British Domestic Electric Appliances, Ltd. (" Mary Ann "), Electrolux, Ltd., Vactric, Ltd., Tellus Vacuum, Ltd., Easiwork, Ltd., Pneumode Electrical Appliances Co., Ltd., John Shaw & Sons (Wolverhampton), Ltd. (" Trojan "), and the General Electric Co., Ltd., all have equipments with various improvements. The new " Magnet " cleaner has a power-driven brush.

Cookers, Fires and Water Heaters

We were unable to find any new cooking developments beyond those introduced at the British Industries Fair a few weeks ago. The new Hotpoint, Jackson, Belling, " Magnet," " Creda " (Simplex Electric Co., Ltd.), and " Falco " (Falkirk Iron Co., Ltd.), equipments are all on show.

Among the fires the " Iris " is a new Simplex development available in one- and two-bar types in sprayed silver or bronze. The Dowsing Radiant Heat Co., Ltd., is showing the " Raytonic " fire which has a 1,000- or 1,500-W element recessed in a cast-iron frame through slots in which a glow is projected from an internally suspended 250-W lamp which also creates convected heat. Berry's Electric, Ltd., has a range of new inset fire and slate surround combinations ready for screwing to walls without recesses. Candy & Co., Ltd., have introduced a 2-kW stainless-steel fire inset in a slab tile panel for wall fixing. The fire fits in with clips. A small 1-kW fire with a faience surround is also shown. " Trilite " (Falkirk) fires, Belling imitation-coal and log fires, and reflector models shown by Jackson, and Bratt Colbran & Co., Ltd., cannot fail to interest and instruct.

Perhaps the most recent development among the Jackson, Creda, Berry's Electric, and " Magnet " thermal-storage water heaters on show is the new 1½-gal. " Quickservice " Jackson heater for installing over wash basins, &c. It is one of the new range introduced to E.D.A. specification, and among the improvements incorporated are more efficient lagging and an anti-drip device. Interesting immersion heaters on the stands of Hotpoint, Belling, and Aidas, Ltd., include an immersion heating group recently introduced by the last mentioned company, embodying its own mercury switch thermostat. It can be fixed vertically or horizontally, and to both cylindrical and flat tanks.

There is evidence of a movement to introduce washing machines at prices approaching those more likely to attract ordinary householders. Beatty Bros., Ltd., have a model at 23 guineas, complete with a wringer. A new feature of some of the Beatty equipment is a safety bar across the front of the wringer which permits the clothes to be fed in without putting the fingers close to the rolls. There is also a new " Thor " wringerless washing machine which incorporates a hydro-extractor and holds 6 lb. of dry linen. The Hotpoint gyrator machine and equipment by Wilkins & Mitchell, Ltd., are popular items.

Lighting

It would be impracticable to attempt to review the lighting equipment at the exhibition as a whole. Apart from exhibits which are to be found in all sections of the show, with perhaps some of the best examples outside the electrical section, lighting plays a very important part in the furnishing of every stand, and in the general arrangements of the exhibition.

Above all there is a gigantic rainbow. In this the colours of the spectrum are imitated by chromed zinc troughs, in front of each of which is an arc of neon tube. There is some 630 ft. of tubing in all, supplied by Claude General Neon Lights, Ltd.; Venreco, Ltd., were responsible for the construction and installation.

An attractive display by E.L.M.A. is designed to demonstrate lighting principles, lamp quality, the cheapness of electric light, &c. Crompton, Parkinson, Ltd., and the G.E.C. are both displaying their ranges of productions. Louis Dernier and Hamlyn, Ltd., have a new range of " Neolux Facet " fittings constructed of strips of glass built up in cylindrical form in metal ends. They are supplied in up to six-unit fittings in a variety of colours. Of particular interest is a development of N.L. Reflectors, Ltd. By a mixture of filtered and unfiltered light the daylight spectrum is reproduced, and considerable savings in consumption are claimed. The Sheringham daylight system is also displayed.

The E.D.A. exhibit includes an electrically equipped kitchen, laundry, dining-room, lounge, and an information bureau. The above by no means exhausts the variety of electrical equipment to be seen. There are synchronous electric clocks by Ferranti, Ltd., and Smith's Electric Clocks, Ltd.; Bulle electric clocks; high-frequency apparatus by Ideal Home Electrical Appliances, Ltd.; " Hanovia " ultra-violet light equipment; a " Thor " juvenator; the " Metlex " illuminated mirror; Dowsing's " Solarium " heat-treatment cabinet; " Ever Ready " batteries; and " Crypto " hand dryers. An airing cupboard, 2 ft. 9 in. high, 2 ft. 6 in. wide, and 9 in. back to front, with a 500-W element, is a new Dowsing production. The Edison Swan Electric Co., Ltd., shows a complete range of its well-known domestic appliances, including a new radiant-type boiling plate produced by the Metropolitan-Vickers Electrical Co., Ltd.

Employés in the radio assembly shop at Messrs. Ferranti's factory at Hollinwood are now entertained by musical programmes from large moving-coil loudspeakers. Despite the lateness of the season the department is still very active

MEETINGS AND DISCUSSIONS

Current Topics and Opinions Expressed at the Institutions

How X-ray Current and Voltage are Measured

THE measurement of hot-cathode X-ray tube current and voltage is dealt with in the paper which Dr. G. W. C. Kaye and Mr. G. E. Bell read before the INSTITUTION OF ELECTRICAL ENGINEERS in London on March 30th. The authors outline the results of an investigation made at the National Physical Laboratory to determine the dependence of output on the exciting peak voltage V and tube current I, as measured by a "free-air" ionisation chamber or by a photographic method.

The output varies with IV^n. When excited by constant voltages ranging from 65 to 150 kV the output is proportional to some power n of the tube voltage, and when the X-ray beam is but lightly absorbed, as is the case with the Coolidge tube with no filter, the exponent n is nearly unity. As the degree of filtration is increased, n increases, reaching a value of 4.2 when the radiation has passed through 0.75 mm. of copper. In the case of the "Metalix" tube the exponent was found to increase from 2.75 with no filter to 4.64 in the case of a filter of 0.75 mm. of copper.

It is suggested that n depends mainly on the degree of filtration, and only to a lesser extent on the design and other features of the tube. At any particular voltage and current the X-ray emission depends directly on the atomic number of the material used as the anode; in modern practice the latter is invariably made of tungsten.

The various types of valve rectification circuits suitable for X-ray work, and the influence of voltage and current wave-form, are discussed. It is shown that for like values of peak voltage and milliammeter readings, the X-ray outputs for full-wave and half-wave rectification are the same over the voltage range 40 to 80 kV, while the output for constant voltage is about 1.8 times larger. From an X-ray point of view the essential factors of voltage excitation are the peak value and the wave-form. The several methods of measuring high voltages are dealt with. As regards tube currents, the moving-coil milliammeter customarily employed only indicates the mean current and not the maximum current through an X-ray tube excited by pulsating voltage. It is concluded that while the moving-coil milliammeter is adequate for the measurement of sustained tube currents, it is better to turn to some form of ballistic meter for currents lasting less than about a second.

Electricity Can Help Civil Engineers

THE use of electricity on the sites of civil engineering works is advocated by Mr. G. T. Allcock in the paper which he read before the Manchester and District Association of the INSTITUTION OF CIVIL ENGINEERS on March 29th.

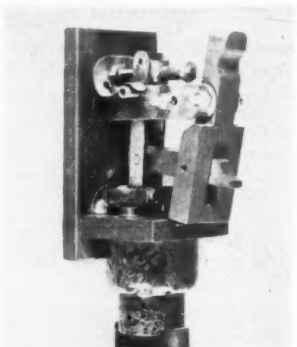
The author says that he makes no claim to a wide experience of civil engineering works. He writes as an outsider, who realises the importance of labour charges on such work, and hence can appreciate the reason for the increasing mechanisation of the industry. He is surprised, however, as an electrical engineer, to find how little electricity shares in this mechanisation. For quarries, docks, harbours, builders' yards, for any position in fact where machinery is installed on a permanent basis, civil engineers make full use of electric drive. But for similar machinery that is moved round from one building site to another there seems, at present, to be a tendency to favour the internal combustion engine.

It is endeavoured to show that electric drive is the better proposition for the builder and public works contractor in all cases where supply can be obtained. Supply conditions are daily becoming more uniform throughout the country. In all other industries the development of mechanisation is being attended by increased electrification, and it is difficult to see adequate grounds for a reversal of this tendency and a return to the system of small engine units in the case of the contracting industry.

The author believes that greater interest in this subject, and a discussion of the special limitations imposed by use on site would lead to the development of self-contained electrically driven machines that are definitely more serviceable than anything now available, and he submits that the question of electric drive for portable machinery is one that justifies the careful consideration of all civil engineers.

Some Factors in Power Station Efficiency

IN opening the discussion at the INSTITUTION OF ELECTRICAL ENGINEERS on the paper presented by Mr. W. S. Burge on "The Present Practical Limits of Power Station Efficiency" (reported in our last issue), Mr. I. V. Robinson predicted that in about five years' time the method of calculating the properties of steam due to M. Darrieus (of Paris) would be in general use as it enabled the heat loss to be ascertained in every item at a power station. He did not agree that steam extracted for feed heating should be dealt with separately, and considered that the turbine should be dealt with as an entity.



A 1-A 230-V wax-operated switch after clearing a short-circuit of 300 A inside the wax without external damage. An article on the principles involved appeared in our issue of February 3rd.

Mr. Robinson said that engineers, in consequence of the Electricity Commissioners' thermal comparison tables, had sometimes put in plant that was too expensive for the load carried. The overall efficiency of the stations should be expressed in the cost per kWh sent out, adjusted for load factor. He doubted the wisdom of striving after small reductions in generating costs in view of the large reductions in transmission and distribution costs required.

Mr. C. L. Blackburn, referring to experience gained at the Dunston 50-cycle station, contended that the author had not done justice to reheating. There was a gain of 9 per cent. from reheating at 1,200 lb. per sq. in. over non-reheat at 650 lb. and 6 per cent. between reheating and non-reheating at 650 lb. The efficiency guaranteed for the reheater boilers at Dunston was the same as for the normal evaporative boilers. The capital cost of the reheater equipment was less than that of the increased boiler and condensing plant capacity that would be required without reheating. The extra cost of reheating plant at Dunston was £30,000 (4s. per kW installed), so that an increased efficiency of 5½ per cent. would be obtained at an extra capital cost of 1½ per cent.

The Advantages of Automatic Control

Mr. L. L. Robinson said the Kent all-British automatic control of the Simon-Carves boilers at Hackney (ELECTRICAL REVIEW, May 27th and June 3rd, 1932) had been in use for about nine months. Although the control was nothing like so complete with stoker firing as it would be with powdered-fuel firing, 50 per cent. of the load could be suddenly thrown off with a steam-pressure variation of only 2 per cent. Weekly tests of each system had shown efficiencies of 84 per cent. with hand control and 87.1 per cent. with automatic control. The conditions of loading were not quite so good during the week of hand control, but he believed that the keenness displayed would fall off over a long period and the advantages of automatic control would then become more manifest.

He preferred 3,000-r.p.m. machines, especially in view of the greater difficulty in starting up 1,500-r.p.m. sets from cold in emergency. The maximum station load at Hackney on the Central Board's basis was 26,800 kW, and the kWh generated 1,970,000, with a load factor of 45.32 per cent., but the average load for the week was only 12,310 kW. The thermal efficiency (1.35 lb. per kWh) was 21.37 per cent., whilst on the evening shifts on Monday, Tuesday, and Wednesday it was, respectively, 24.5, 24.07, and 24.3 per cent. The capital cost was only £13.9 per kW on the half-completed station and would be £12 per kW on the completed station.

Mr. S. B. Jackson suggested that the paper demonstrated the fallacy that load factor was the predominating item in thermal efficiency. One must first assess the inherent efficiency of the plant, and, secondly, assess how closely that inherent efficiency was approached. An operating factor of 98 per cent. could be reached.

Mr. C. Verity said that a statement of the theoretical possibilities of the heat cycle was needed which gave a better figure

than either the Rankine efficiency ratio or the adiabatic heat drop. The author's method of evaluating the bled steam was useful, but he had not explained how the factor for the power to be credited to the bled steam had been obtained. He preferred the method of M. Darrieus, which arrived at an efficiency factor based on the maximum theoretical, taking into account the heat cycle adopted, but allowing only for factors uncontrollable by the operating engineers. The use of a temperature entropy diagram might therefore be suggested. From what he had seen on the Continent he deprecated the suggestion that the water storage capacity of boilers should be reduced to anything like the figure which the author had given in his paper.

Mr. A. L. Lunn agreed that the coincidence of the plant item efficiencies was of far greater value than the selection of steam conditions. To speak of a station efficiency of 20 per cent. was of no use for comparison with another, whereas the author's method gave the true merit. More information as to the cost of obtaining efficiency would have been welcome; an isolated station with two peak loads per day must carry standby plant and could not be compared with a station that was linked up with others.

Mr. D. Wilson demurred from the view that high moisture content was a disadvantage. He asked the author whether he thought better results could have been obtained in the examples quoted if an American coal had been used. He failed to see how the use of a higher grade fuel would have improved the results quoted in the paper. A test recently carried out gave an efficiency of 89.9 per cent., using a coal of 11,300 B.th.u., which indicated fairly high moisture and ash contents.

Mr. H. S. Carnegie stated that at Barking the makers' guarantee was 9,850 B.th.u. per kW, against 9,280 for Dunston, the machines at Barking being 75,000 kW (impulse) and at Dunston 50,000 kW (reaction). The conditions were the same in both stations and the difference between the figures was really that between the guarantees for reheating and not reheating.

The author, in his reply, said that M. Darrieus' system of analysis appealed to him, but his own idea had been to set out an analysis of possible results from power stations that could be accepted as a standard based on current practice, the endeavour being at the same time to separate the inherent features from the variables. He did not see how a case could be made out for reheating with pressures up to 650 lb. and 850 deg. He agreed that automatic combustion control should be an important factor in dealing with emergency conditions, if it functioned properly.

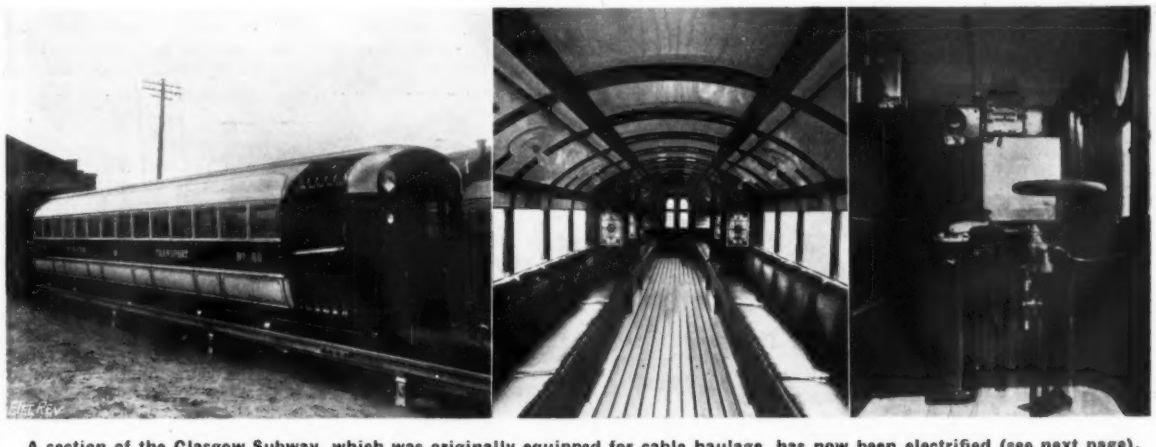
A Versatile Material

AT a recent meeting of the BIRMINGHAM SCIENTIFIC SOCIETY Mr. A. C. Hitchon lectured on synthetic resins, and illustrated his lecture with numerous slides and the "Bakelite" film. Mr. Hitchon said that natural resins, when heated to melting point, become liquid and solidify on becoming cold. This can be repeated time after time, but a synthetic resin can be made so that it does not remain permanently fusible.

There are many types of synthetic resin, made from different substances, but the original is the resin made from phenol and formaldehyde, both of which are strong-smelling disinfectants, but which produce, when reacted together, an almost odourless substance. A powder is produced from a mixture of these substances, and this can be moulded under heat and pressure to make a material hard, transparent, and resistent to hydrofluoric acid. By the addition of solvents to the powder a varnish is made which is used for impregnating electrical coils, and for coating articles which have to resist corrosion; the addition of pigments produces a resinoid enamel which is used extensively for the coating of resistors for radio. This powder, when mixed with wood flour, cotton linters, mica, asbestos, or slate dust, produces the familiar moulding materials which have a thousand uses.

Paper or woven fabric impregnated with resinoid varnish and then pressed into solid sheets is known as phenol resinoid laminated, and one of the uses to which it is put is that of the making of gears and pinions. Heavy-duty laminated pinions operating on motors driving industrial machinery frequently outwear metal, are silent in operation, and resist the ravages of vermin and rodents; they are resilient but self-supporting, and, except when employed in cases in which heavy starting torque is encountered, they require no side plates or shrouds.

No single property, such as dielectric strength, surface resistivity, &c., is responsible for the extensive use of resinoid laminated as an insulator, but the combination of all its properties in general is the reason for its being employed as such. For instance, it is stronger and more accurate dimensionally than porcelain, more uniform than mica, more permanent in chemical structure than rubber, more heat-resistant than shellac, less apt to shatter than glass, and more water-resistant than fibre.



A section of the Glasgow Subway, which was originally equipped for cable haulage, has now been electrified (see next page). Our illustrations show the first car, exterior, interior, and the driver's cabin

Diesel-electric Trains as a Temporary Measure

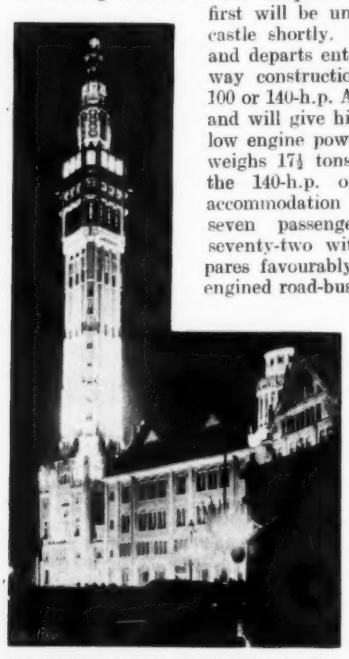
SEVERAL aspects of Diesel-electric railway traction are considered in the paper which Messrs. C. J. Hyde Trutch and C. M. Beckett read at Derby on March 24th at a joint meeting of the INSTITUTE OF FUEL and six other societies.

That more revenue would be brought in by a continuous electrical service and that with electrification the extra running costs will be comparatively small is not to be doubted, but in the authors' opinion track electrification should be justified entirely upon traffic density considerations with no increase in passenger seat miles above that at present ruling. If on this score the scheme is justified then it should be proceeded with, and the known fact that revenue will increase (but to an unknown amount) should be treated as a margin of safety. If it is not justified on this score, then Diesel electrification should be carried out, perhaps as a temporary measure until the revenue increase can be accurately measured or forecast, the Diesel units then being moved to perform a similar duty in another sector or perhaps to fulfil permanent requirements in a less dense zone.

The final effect of attracting the public to a well-served district is an increase in rush-hour requirements which determine the capital cost of a scheme of Diesel electrification, and give track electrification its undoubted advantage over its rival. But during the process of attracting the public to a new district, and before the public has arrived in sufficient quantities to cause the heavy rush-hour traffic, the Diesel-electric system can give at a moderate outlay the frequent and regular service which is needed. Steam cannot pave the way for electrification, and if electrification has to do its own salesmanship, there are many lean years before profit earning commences. Diesel-electric trains can pave the way for electrification, and incidentally provide large savings while the

experiments are in progress. The author shows that the first cost of the equipment will be paid off within five years.

A new type of rail-bus has been developed by Messrs. Armstrong-Whitworth for frequent light services, and the first will be undergoing trials at Newcastle shortly. It is very lightly built and departs entirely from orthodox railway construction. It is fitted with a 100 or 140-h.p. Armstrong-Saurer engine, and will give high schedule speeds with low engine power. The 100-h.p. vehicle weighs 17½ tons in working order, and the 140-h.p. one 19½ tons. Seating accommodation is provided for fifty-seven passengers with luggage, or seventy-two without. The price compares favourably with that of a Diesel-engined road-bus.



The Belfry at Lille floodlighted. The installation was designed by the General Electric de France, Ltd.

Discussion

Sir Philip Dawson, chairman, in opening the discussion, said that for use on sidings and branch lines Diesel-engined units were certainly worth very careful consideration.

Sir Henry Fowler said he did not think anyone doubted that the Diesel - electric locomotive and car could be made to do satisfactorily any work asked of them. The difficulty had been lack of proper appreciation of the best size of driving unit. Lately the h.p. of i.c. engines had been too small for what the traffic people wanted to put behind them. Branch lines could not be worked twenty-four hours per day; the burden of first cost sank many proposals.

Mr. H. Chambers (Derby) said that the initial costs of Diesel and steam locomotives were in the ratio of 3 : 1, and that the life of a Diesel locomotive was fifteen years as compared with twenty years for a steam locomotive of comparative power. Bearing in mind the increased interest and depreciation charges for the Diesel locomotive, he could not agree with the authors that within a short time the savings effected in fuel costs would completely dissipate the extra initial costs. For a small unit of about 100 h.p., was electric transmission necessary? Mechanical transmission should be sufficient. To Mr. H. Atherton it seemed feasible to use Diesel engines for auxiliary work, but he did not imagine they were likely to be successful in the near future for express trains between, say, Manchester and London.

Mr. Woolescott (Ilkeston) remarked that, although the total weight of Diesel locomotives compared favourably with that of steam locomotives, they had a shorter wheelbase, and the bending load on bridges might be heavy; he appreciated that there was no hammer blow, as with steam locomotives. Mr. Allwood said that possibly Diesel-electric locomotives could be used on lines feeding electrically operated main lines. Mr. Dixon thought that as petrol was superseded by crude oil the price of petrol would decrease and the price of the crude oil would increase, so that the figures on which the authors had based their prophecies were fictitious. Mr. L. M. Jockel said that maintenance costs covering shorter periods than five to seven years were of no practical value. The maintenance costs of marine Diesel engines, even on high-class passenger ships, had proved formidable, and one well-known company had sold its Diesel ships for that reason, although the results for the first five years had been excellent.

Definite Costs Wanted

Mr. P. C. Pope (secretary, Institute of Fuel) requested the authors to prepare a balance-sheet, as cost was in the minds of most speakers, and it was the principal unknown factor. Some 40 per cent. of the total petrol produced was obtained by cracking fuel or furnace oil. Cracking was more expensive than straight distillation, and none of the petrol companies wanted to do it, so that one need not worry for many years to come with regard to the supply of Diesel oil. Mr. Cooper (Leicester) pointed out that petrol-electric drives for buses were being displaced largely by straight drives, and he asked if there were some limitation which was likely to apply also to Diesel-electric railway units. Mr. Chaytor asked the authors why they neglected straight track electrification. The modern electric locomotive was the most reliable plant existing. Mr. H. B. Young said that at least one-third of the cost of a Diesel-electric locomotive must be represented by the electrical portion.

Mr. Trutch, in a brief reply, said that if the fallacy of comparing a single Diesel locomotive of one particular class with a single steam locomotive of the same class had been shown to be wrong in principle, then one purpose of the authors would have been achieved. To get a true view, one must work out a balance sheet for a complete service; all such estimates prepared to date had shown that the capital cost with Diesel locomotives was not very much more than with modern steam locomotives, and in some cases less.

Rubber Latex

At a joint meeting of the Yorkshire Section and Plastics Group of the SOCIETY OF CHEMICAL INDUSTRY on March 27th, Dr. D. F. Twiss, chief chemist of the Dunlop Rubber Co., read a paper on the industrial uses of rubber latex which, he said, offered definite advantages. Rubber can be compounded while still in the latex form, although there are limitations. The consistency and concentration of the latex can also be adjusted to suit various manufacturing needs. The latex can further be modified by vulcanisation or flocculation. The changes produced by vulcanisation, however, can be effected equally well, at least, after formation of the article from latex. The ease of incorporation of compounding ingredients into latex and the elimination of the heavy milling process permit the use of the most active accelerators without danger of scorching or premature vulcanisation. Manufacturing processes involving the application of latex are electrodeposition processes; dipping processes, including spreading, etc.; moulding processes, and such variations as the production of latex rubber thread and sponge, rubber-bonded fibres and abrasives, and the protection of metal surfaces.

The Electrification of the Glasgow Subway

THE Glasgow "Subway" was opened for traffic as a cable haulage system in 1896, but as it did not fulfil expectations it was subsequently closed down. It was purchased by the Corporation in 1923 for £381,589 (less than one-fourth of the original cost). Losses, which have been incurred every year now total £250,000, and in September, 1932, the general manager to the Transport Committee (Mr. L. Mackinnon) recommended that a trial scheme of electrification prepared by Mr. W. R. Bruce, should be made.

The Subway consists of two 6¼-mile endless cylindrical tubes with internal diameters of 11 ft. The sharpest curves on the 4-ft. line are of 660 ft. radius, and the steepest gradient is 1 in 20 where the tunnels dip under the River Clyde. The greatest depth from the surface of the street to the top of the tunnels is 115 ft., and the least 7 ft. There are fifteen stations on the line, which extends from the centre of the city to the west on either side of the River Clyde.

The section chosen for the experiment extends from Merkland Street Station (Partick) to Copeland Road (1,985 yds.).

With redesigned bogies and rearrangement of the body underframe there was just room for four 60-h.p. tramway motors to be fitted to the experimental coach. Electro-pneumatic switchgear with remote control through a master controller is in use with automatic acceleration.

The current is conveyed from the "live" rail to the train by two collector shoes, one on each traction bogie. The collector gear is mounted direct on the side frame of the bogie. Braking is by compressed air, but with manual operation in emergency, duplicated on the rear of the coach. A train will consist of a motor coach and a trailer, and braking will take place on both vehicles simultaneously. The air supply comes from an electrically driven automatically governed air compressor suspended from the underframe of the carriage.

Lighting current is obtained from two conductors carried on insulated supports on the wall of the tunnel, and also from the traction supply. The sliding gates at each entrance are coupled to pneumatic door engines with push-button control, and a train cannot be started until all gates are closed. The wooden seats have been replaced by well-sprung seats upholstered in leather.

The cost of complete electrification has been estimated at £94,000, of which the cost of relaying 13 miles of track and installing the third rail accounts for £45,000 and reconditioning the twenty trains to £30,000. The savings are expected to amount to £28,150 per annum, including £9,700 for cables and track sheaves, £8,000 for gripmen and conductors, and £7,000 for power. These figures take no account of additional traffic expected. A speed of 21 m.p.h. was attained on the trial runs, reducing the time for the complete circuit of the Subway from 38 to 23 minutes.

Correspondence

Correspondents should forward their communications as early as possible. No letter can be published unless we have the writer's name and address in our possession

The " Bakelite " Case

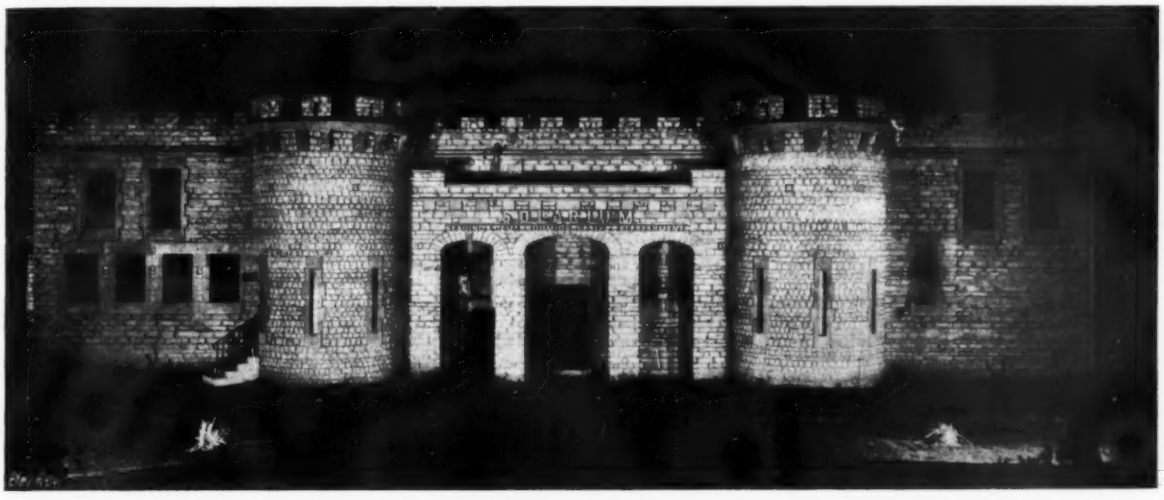
I admit that I am not an expert on legal matters, but I and many of your readers, I am sure, would be interested to know how the recent " Bakelite " case [reported in our last issue.—EDS. E.R.] comes under the Corrupt Practices Act.

On the face of it one would imagine that the only offence committed was on the part of the man who disclosed to an outside party information which he possessed, contrary to his agreement with his employers. One would have thought that the only action which could be taken would be an action for damages against this individual by his employers.

If the case is to be regarded as a precedent, it would appear that no manufacturer is safe from prosecution at Common Law for purchasing scientific information from experts who have specialised in the particular branch of science in which the manufacturer may be interested. Moreover, the position of an employé of any company manufacturing specialities becomes extremely delicate, insomuch that if he uses his scientific training outside his ordinary employment in any form whatever to his pecuniary advantage he is classed as a criminal, liable to be proceeded against by the Public Prosecutor.

The case is one which might be far reaching in its effects, and an expression of opinion by your various competent contributors would prove useful as a guide to a large number of people engaged in business.

NEWTONS OF TAUNTON, LTD.
Taunton, *March 20th.* W. S. PYRAH, *General Manager.*



The Sun Castle Solarium at Skegness is a very spectacular sight when floodlighted. Holophone " F.L.500.E/R " units are employed for the purpose

The New " Strowger " System

I think a little more stress might have been laid on the special features that have been incorporated in the new Wigan automatic telephone exchange mentioned in your last issue. It is the first exchange in the provinces operating on a new principle developed by the Automatic Electric Company of Liverpool and is really a modification of the existing " Strowger " telephone system. In the present standard " Strowger " system, which has been installed in London and several of the principal towns in this country, switching operation is under the control of a number of relays which are definitely tied to individual switches. The number of relays on each switch depends upon the particular type of switch installed and upon the functions required. The standard group selectors have incorporated with them on the old type equipment five relays, whilst the regular final selectors have either eight or nine relays. Although these relays are necessary to establish the various connections required, only one relay (the switching wiper relay) remains in circuit for the full duration of the call, and for a large proportion of the time that the switch is in use a number of relays perform no useful function; similarly, in the regular final selectors, only four of the eight or nine relays are held in circuit during the conversational period.

In the new system the connecting relays are mounted in entirely separate groups, each group of relays being arranged to control a number of group or final selectors. In these selectors themselves are only incorporated the relays that are held for the full conversational period. An extra relay is, however, required in order to associate the controlling relays with the selector in question. The Wigan Exchange by adopting this new method of common control has been erected at a considerably lower cost than would have been necessary if the original type of equipment had been installed.

The Post Office is also interested in the " Bypath " system, and an exchange incorporating this system, the " Advance," was described recently in the ELECTRICAL REVIEW. Both the " Bypath " system and the common control system show substantial savings in floor space and maintenance, and the Post Office is at the present moment investigating which system shows the most saving in first cost and maintenance cost.

On the " Bypath " system, a subscriber can have six or seven numbers spread over the exchange numbering scheme and full private branch exchange facilities can be obtained, due to the special circuits incorporated on the " Bypath " system, whilst on the " Strowger " system, if a subscriber has a number of exchange lines, these must be consecutive, as otherwise, it is not possible to give full P.B.X. facilities. Of course, if a subscriber has a large group of lines, say, 100, only ten numbers of the regular exchange numbering scheme need to be allocated to him. The remaining 90 numbers can be purely arbitrary and full P.B.X. facilities are given to this large group subscriber by installing third selectors between the second selectors and final selectors. This principle has actually been adopted at the new Mayfair Exchange, London.

March 25th. A. S. J.

Christening the New Lamp

The electrical industry appears to be too busy watching the development of its latest infant to remember the duty of giving it an appropriate name. Within the industry we may refer to it as the " hot cathode " lamp or the " gaseous discharge " lamp, but both terms are quite hopeless for popular use. Now, surely, is the time to choose a name that comes easily to the tongue and conveys some impression of the characteristics of the new illuminant.

As the hot cathode lamp brings us closer to the efficiency of the glow worm, why not adopt the simple term " glow lamp "?

March 18th. PROTONIUS.

Canvassers and Canvassing

That a letter on this subject should follow the letters suggesting a Sales Development Association indicates that our thoughts at any rate are moving in the right direction. Mr. A. V. Cross presents the case with understanding, but why adopt the name " canvasser "? These men are not asking people to vote, they are selling the most useful service the world produces, with appliances that bring increasing pleasure with use. A better name would be " Advice Engineers."

The possibilities of useful service which the right type of man can render a supply undertaking, provided he is fully supported in his work, are almost unlimited. To be successful he must have a wide engineering knowledge and experience, a good technical background, and be a salesman. The combination is not easily obtained. A man cannot be a successful Advice Engineer without these qualifications. In the

course of one week he may be called upon to give advice readily and without hunting through several lists, &c., about refrigeration, water-heating, a water supply, cooking, the application of power in a works, or any business establishment, and any kind of lighting or heating. To do this skilfully requires a wide knowledge and understanding, and the man who can keep himself up to this level finds that really he is not a canvasser but a consultant, and in 80 per cent. of the cases he gets business. The Advice Engineer can be to the supply business what the commercial traveller is to the wholesale business house, a source of continual revenue. L. H.

March 20th.

A Call to Action

Will you permit me to express my thanks to "C.E.E." for his proposal to ameliorate the hopelessness of the position of many of us unemployed and, also, to you for your kind support of his appeal. Handicapped by age and with few—if any—friends or even acquaintances, due to long service abroad, I, and a great many others, have for months and years endeavoured to find a market for our labour and a livelihood for ourselves and our dependants without success.

Expert advice coupled with a continued interest in each case would be exceedingly helpful in our fight and would evoke feelings of sincere gratitude. R. JOBSON.

Varberg, Sweden, *March 20th.*

Slide Rule Decimal Points

Replying to Mr. B. C. Vaughan's letter appearing in your issue of March 10th, I presume that by "logarithm of the answer" he means the sum of the characteristics of the logarithms of the factors of a calculation. Assuming that one performs the multiplications and divisions more or less alternatively, thereby reducing the number of settings of the slide, I would like to point out the advantages of totting up the characteristics *after* using the slide rule.

It often happens in practice that the slide does not protrude to the left until after a number of operations have been made. Until such an event, one's mind is entirely relieved of the stress of remembering a number, whilst engaged in manipulating the slide rule. (Mr. Vaughan has to carry a figure in his head for each and every operation, including those cases in which the slide protrudes to the right as well as to the left.) It often happens, too, that a division resulting in the slide protruding to the left is followed by a multiplication with the slide in the same position. In this case one can mentally cancel the tally for these two operations. No matter how complicated the calculation, the tally commences with +1 or −1 as the case may be, and seldom does it amount to beyond, say, +3 or −3.

These points are perhaps only of psychological interest, but to me they seem to facilitate finding the position of the decimal point. In totting up the logarithmic characteristics *before* using the slide rule, I think Mr. Vaughan is sacrificing some of the convenience of the system described in my letter published in your issue of February 17th. A. E. ROBINSON.

Uccle, Belgium, *March 27th.*

A Complaint from Scotland

Referring to the letter headed "A Complaint from Scotland" by "Fife" which appears in the ELECTRICAL REVIEW of March 24th, may it not be that the delays of local councils in granting consents to the use of overhead distributors, and the difficulties which often arise in obtaining wayleaves for cross-country lines bringing the supply to the towns and villages, are the real causes of complaint? FIFER.

March 28th.

Rural Distribution

I am afraid a misleading error has crept into the report of my contribution to the discussion at the meeting of the Overhead Lines Association on March 15th. It is stated that I said that in the Bedford district, over an area of 126 sq. miles, there are 2,000 motors out on hire; the correct figures are an area of 110 sq. miles and 26 motors on hire.

London, W.C.2, *March 27th.* F. E. ROWLAND.

A New Single-phase Motor

THE single-phase induction motor described below has a fair starting torque and a wide speed regulation which are obtained merely by connecting together certain points of its primary winding.

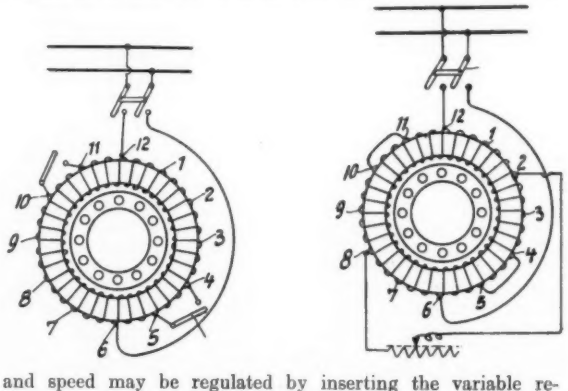
The motor consists of a stator with a distributed primary winding of the ring or drum type, and of ordinary rotor. The primary winding is connected at the points 12 and 6 to the single-phase supply, thus producing in the stator an alternating field with the axis of magnetisation in the direction 12-6. Starting is accomplished by short-circuiting the primary winding at the points 10 and 11. An auxiliary pole is thus produced which leads in phase to the main pole at 12. The artificial rotary field generated in the stator from 10 to 12 exerts a starting torque on the rotor in a clockwise sense. The starting torque may be considerably increased by a second short-circuit 4-5 opposite to the first.

After starting, the switches may be opened, and the motor will continue to rotate as a plain single-phase induction motor. With small motors it is of advantage permanently to retain the starting short-circuit, provided it extends over a relatively small angle, *e.g.*, 30 deg. It is claimed that small motors, in particular, may be operated at higher speeds and efficiencies than could be obtained with a plain single-phase primary winding.

The rotation of the motor can be reversed by displacing the terminals of the primary winding with respect to the starting short-circuits. The motor rotates in a counter-clockwise direction by connecting the primary winding to the line at 9 and 3, and retaining the short-circuits at 10-11 and 4-5, or by providing short-circuits, at 1-2 and 7-8 and retaining the terminals at 12 and 6.

Speed regulation is accomplished by providing, in addition to the short-circuits, a variable resistance between points of the primary winding on different sides of the axis of magnetisation. If the variable resistance is connected to the points 9 and 3, the speed of the motor may be regulated between standstill and normal speed. With starting short-circuits 10-11 and 4-5, and a speed control circuit between 9 and 3 proper regulation can be obtained only if the rotor winding has a relatively high resistance. In order to attain regulation of speed for a rotor winding with a relatively low resistance the variable resistance should be connected at points somewhat nearer the short-circuits or even immediately to the latter, or the starting short-circuits should be made between 11 and 9 and between 3 and 5, and the speed control circuit connected to the points 8 and 2 or also immediately to these short-circuits. In general the speed range, especially downward, depends greatly upon the character of the rotor winding, a low resistance winding yielding a smaller and a high resistance winding a larger speed range. In the arrangement shown in the right-hand diagram the short-circuit 8-2, without the short-circuits 10-11 and 4-5, exerts a starting torque in the same sense as these short-circuits; in spite of this the short-circuit 8-2, if used in conjunction with one or both the other short-circuits will act as a speed reducing circuit. In like manner the short-circuits 10-11 and 4-5 may also be combined with a speed-control circuit connected between the points 10 and 4 or between 11 and 5, this speed-control circuit alone acting in a sense opposite to that of the short circuits.

The motor will start in clockwise sense, due to the short-circuits 10-11 and 4-5, with an open circuit between 8 and 2,



and speed may be regulated by inserting the variable resistance. With a fully short-circuited speed-control circuit between 8 and 2 the motor will still rotate at a considerable speed in the sense of the short-circuits 10-11 and 4-5, so that this control circuit may be used if a regulation of speed is desired only within the upper part of the speed range of the motor. With a speed control circuit connected at 10 and 4 the motor may not only be regulated down to standstill at a full short-circuit between 10 and 4, but also reversed to rotate in counter-clockwise sense, unless some part of the resistance is still in circuit.

Regulation without the use of resistance may be obtained by a speed-control circuit connected progressively between the points 3 and 7, 3 and 8, and 3 and 9, permitting a variation in the speed of the motor to be made in three steps between standstill and normal speed.—C. A. LOHR.

New Apparatus and Devices

for Domestic, Cooking and Heating, Lighting, Power and Scientific Purposes

New " Trojan " Products

One of the latest " Trojan " products to be introduced by MESSRS. JOHN SHAW & SONS (WOLVERHAMPTON), LTD., Wolverhampton, is a " Bakelite " hair-dryer incorporating a mirror. Cool operation is assured by the fan running round the motor. The fluted handle and air nozzle are both detachable, and the controlling switch can be easily operated by the hand holding the dryer. It can be obtained for 32s. 6d. in a variety of colours.

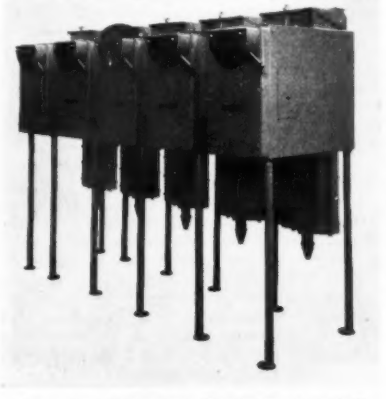
The " Trojan " hair-dryer

The " Trojan Star " vacuum cleaner, another newcomer, has its motor mounted on a " Bakelite " cowl, and the whole assembly is insulated from the body by a substantial pure-rubber ring completely surrounding the cowl and motor frame. The body is made of heavy-gauge sheet metal with all bright parts nickel-plated, and is covered with " Rexine "; it is cylindrical in shape and rests horizontally on two runners, the cable entry being at one end of the cylinder close to the lifting handle. The price is £5 19s. 6d., and there is a twelve months' guarantee.

An Oil-immersed Isolator

A feature of the new Ferguson, Pailin type " IB " isolator is that the design permits a number to be built up into a switchboard complete with busbars, as shown in the accompanying illustration. This arrangement has a particular application for service in sub-stations, to split up feeder circuits where automatic oil circuit breaker protection is not essential, a considerable economy in switching equipment being thus effected. Extensions may be easily made later.

The new type is completely metal-clad and oil immersed, and is capable of dealing with its full load current. Provision is made for three positions of the switch, " on " " off," and " earth." With the earth position is incorporated a set of conveniently placed cable testing sockets. The isolator is fully interlocked and it is impossible to remove the access cover until the switch is " off " and earthed. The isolator cannot be earthed until the switch is first in the " off " position, and access cannot be made to the earthing terminals for cable testing until the isolator is definitely earthed. A gate arrangement is incorporated in the operating mechanism which demands that two distinct and separate operations must be made to switch the isolator from the " on " to the " earth " position. As a precaution against unauthorised operation, the switch may be padlocked in any position.



The new Ferguson, Pailin type " IB " isolator link board

The isolator is extremely compact and occupies the minimum of space. It is positive and quick in action. All parts likely to require inspection or adjustment are readily accessible, while the robust construction ensures long life. The isolator is manufactured by MESSRS. FERGUSON, PAILIN, LTD., Higher Openshaw, Manchester.

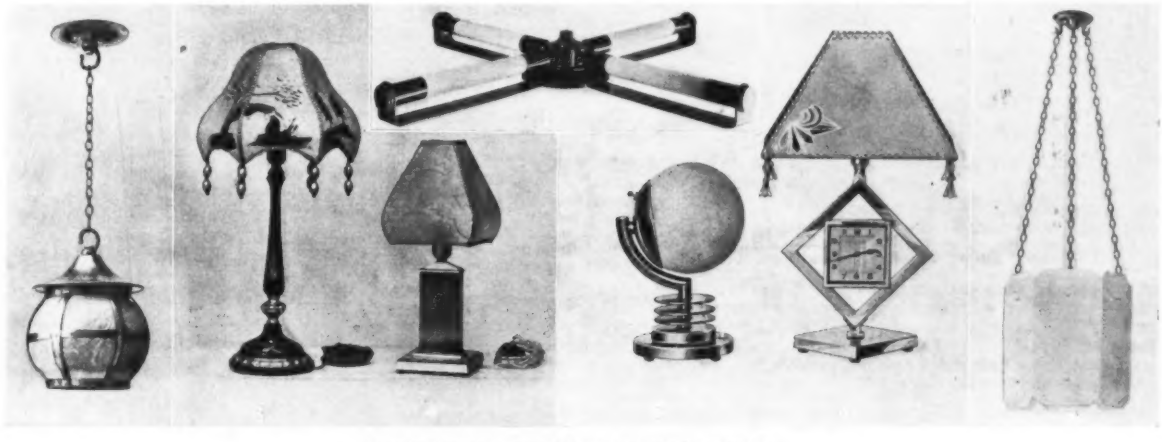
A Copper " Swan " Kettle

MESSRS. BULPITT & SONS, LTD., Swansea Works, Birmingham, have introduced a new " Super Table " kettle, made in heavy gauge copper with a hammered and chromium-plated body. It stands on three china feet and does not damage the polish of the table. The element is of the 1-kW " Swan " auto-safety type and the capacity is 3½ pints. The kettle sells at 45s. without earthing connector and three-core flexible, which cost 1s. extra.

The new " Swan " kettle

Fires in Tiled Surrounds

At the factory of MESSRS. MOORWOODS, LTD., Harleston Iron Works, Sheffield, recently, we had some little difficulty in selecting from their new and attractive fires in tiled surrounds two representative ones for illustration purposes. That shown on the left is of very pleasing design in three shades of egg-shell mottled tiles. The outside edge is in dark brown, with a light brown inner strip and a cream centre panel. The colourings are continued on the raised hearth, and the fire is finished in bright chromium plate. Measuring overall 40 in. by 48 in., the complete outfit costs 12 gns., the fire alone being priced at 6 gns.



A selection of new designs in lighting fittings

Siemens Electric Lamps & Supplies, Ltd., 38, Upper Thames Street, E.C.4:—(1) No. E.4099, £6 in brass, £7 10s. in chromium; (2) E.4120, flame-tinted " Marbloid " panels, 13s. 6d.; (7) E.4079, brass, copper, or silver finish, 21s. 6d. The Walker Fender Co., Ltd., Despatch Works, Sherborne Street, Ladywood, Birmingham:—(3) A Chinese lacquer lamp, 45s. 6d.; (4) a small table lamp; (5) a modern spherical fitting; (6) a clock lamp, 96s. 6d.;

Selections from Moorwoods' new range of fires

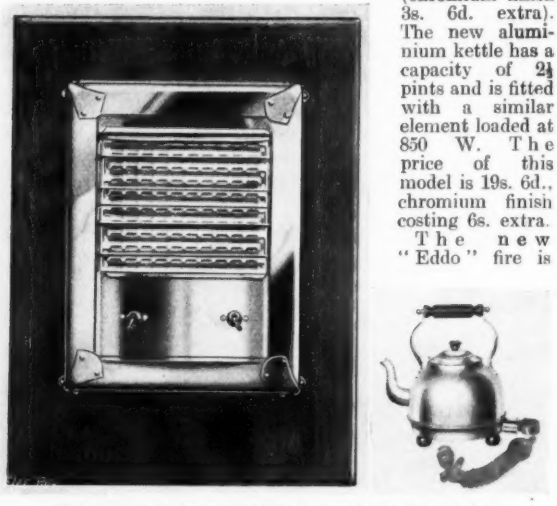
The other illustration is of a 3-kW fire in mottled blue and brown vitreous enamel in a frame of egg-shell mottled tiles to match. Bathroom use is suggested by the simple, clean design and inset style. Costing £3 10s., the fire is also available for direct fixing to a tiled wall with a suitable opening. The surround costs 2 gns.

Other models include a fire with a cornered arch-shape surround, 28 in. by 46 in. by 42 in., with a small raised hearth; another in which a modern note is given by an oblique central band in contrasting colour, 24 in. by 14 in., surround only; a pillar-type equipment with deep reliefs and a raised hearth, 28 in. by 44 in.; a 3-kW fire finished in polished stainless-steel with a stainless-steel interior (5 gns.) designed for any standard grate; and a 36 in. by 44 in. pillar-type equipment with raised hearth in two shades of green egg-shell mottled, complete with a 3-kW bright chromium-plated fire.

New "Eddo" Products

The latest products of Messrs. H. G. Moseley & Co., Ltd., Eddo Works, Hospital Street, Birmingham, are two new kettles and a fire.

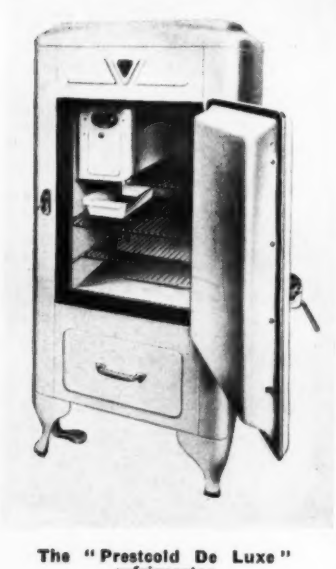
The 3-pint copper kettle is made in one piece, there being no pierced holes and soldered connections in the base. A solid 1-kW refractory ring element is fitted, and the price is 27s. 6d. (chromium finish 3s. 6d. extra). The new aluminium kettle has a capacity of 2½ pints and is fitted with a similar element loaded at 850 W. The price of this model is 19s. 6d., chromium finish costing 6s. extra.



The new "Eddo" panel fire and aluminium kettle

The new "Eddo" fire is of the panel type, constructed of heavy gauge brass, chromium plated, and fitted with two 1-kW elements independently controlled. The price is £3, but a 3-kW model is available with three heats at £3 10s. The fire can also be supplied mounted on a heat insulating panel finished in grained mahogany, oak, or polished black at £1 extra.

An All-steel Refrigerator



The "Prestcold De Luxe" refrigerator

The "Prestcold" refrigerator, introduced by the Pressed Steel Co., Ltd., Cowley, Oxford, is of all-steel construction with heavy chromium-plated brass hardware, and cork heat insulation. There is a useful shelf space with a ledge around the outside on the flat top, and the cooling unit is above the storage space, controlled by one switch giving eight different freezing speeds.

The cabinet interior measures 25½ in. high by 21 in. wide by 18¼ in. deep, so that a storage capacity of 5 cu. ft. is served with a shelf area of 10½ sq. ft. The standard model (for 220/240-V a.c. supplies) costs £43 1s., while the "De Luxe" model, including a hydrator pan and a spacious foot-controlled ventilated dry storage bin below the cabinet costs £46 4s. Models for 100/210 V or 250 V a.c. are also available. Other frequencies, voltages, and d.c. supplies are catered for at a slightly extra cost.

A Watertight Plug and Socket

The Weekes watertight plug and socket is for use with cranes, hoists and movable electric plant in exposed situations such as docks, quays, railway sidings, &c. The plug comprises a brass or malleable cast iron outer shell containing an ebony "Sindanyo" base, upon which are mounted the cast brass terminals for trailing cable cores. Access to the terminals for the purpose of connecting the trailing cable is gained by removing the top cover of the plug casing. The deep skirt which is provided both protects the pins and acts on the diving bell principle in preventing the entry of water.

The new Weekes plug and socket

When the plug is fully inserted in the socket, the face of the ebonite block is flush with the base of the plug and air is entirely excluded from the plug and socket. Condensation of water on the contacts is therefore impossible. A dummy plug is inserted in place of the working plug when the latter is removed, and a key and keyway are cast in the outer shells of the socket and plugs respectively, to ensure that the plug shall always be inserted in the correct position.

The plug and socket are mounted in a ground frame, which is made in two compartments. The compartment containing the socket is completely closed when the plug or dummy plug is in position. The other compartment receives the dummy plug when it is not in use and is closed by a heavy loose cover. The ground frame is not made watertight, water being drained away through drain holes in the bottom.

The plug and socket, which is designed by Messrs. L. Weekes (Luton), Ltd., Luton, has withstood a two days' total immersion test.

Illuminated Island Pillars

With the increasing density of traffic the use of illuminated guard posts, or island pillars, is becoming more and more necessary. The new "Type 1" island pillar developed by the Revo Electric Co., Ltd., Britannia Works, Tividale, Tipton, Staffs, has at the top the words "Keep Left" in 5-in. letters of moulded amber acetate, while "Type 2" has "Keep to the Left" with the first and last words in 4-in. letters. A door in the back of the base gives access to the time-switch and fuses.

Three of the new Revo island pillars

"Type 1" measures 4 ft. 6 in. out of the ground and is 18 in. in diameter, while "Type 2" is 4 ft. 2 in. high and 16 in. in diameter.

Recent "Beeantee" Developments

A "Beeantee" holder fitted with a screw-on skirt

We have received a sample of a new pattern of holder embodying a screw-on skirt from "Beeantee" Illuminations, Ltd., 70, Banner Street, Bunhill Row, E.C.1.

Another new line developed by this company is a range of junction connectors for strip lighting. These can be adjusted without any tools, screws, or cutting, and contact is made by two pointed brass prongs which pierce the covering of the cable. Both the "straight through" and "crossway" junctions are of very neat and simple design, and are entirely waterproof and weatherproof. Both miniature and standard sizes are available for use with 7/.029 twin t.r.s. cable, with or without lugs, or with 3/.029 twin t.r.s. cable. Flashing lights are now possible as a new type of holder, the "Multilite," has been designed for use with three-core 7/.029 t.r.s. cable.

Canadian Electrical Notes. FROM OUR TORONTO CORRESPONDENT

AT Thorald, Ontario, near Niagara Falls, the Hydro-Electric Power Commission of Ontario has just put into operation, for the Ontario Paper Co., a new electric steam generator plant which will utilise off-peak energy supplied at a very low rate per kWh. There are three 3-phase steam generators each of 30,000-kW capacity and each capable of supplying about 85,000 lb. of steam per hour at 200 lb. per sq. in. It is said that these boilers will save the company something over 300 tons of coal per day.

The Electrical Code

With regard to the Canadian Electrical Code, Part II—"Specifications," the Canadian Engineering Standards Association has recently issued an official statement in which it is pointed out that for the present the laboratory of the Hydro-Electric Power Commission of Ontario is the Canadian testing authority. This is in reference to the inspection and testing of electrical equipment for purposes of approval. Now that the Code has been adopted by all the provinces of Canada it is illegal to dispose of, or to attempt to dispose of, electrical equipment, or to use such equipment, unless it has first been "approved." Formerly this applied only to Ontario where the Hydro-Electric Power Commission has full jurisdiction; now it applies to the entire Dominion.

British Manufacturers Combine

On a number of occasions during the past ten or fifteen years the writer of these Notes has advocated the establishment in Canada of some organisation which would handle the products of a group of British firms so as to reduce expenses and enable them to provide more efficient, and more rapid, service.

It appears that this suggestion is to be acted upon, for on April 1st the British Electric Plant Co. (Canada), Ltd., comes into being. The Canadian branches of four well-known British companies—the Lancashire Dynamo and Crypto Co. of Canada, Ltd., Bruce Peebles (Canada), Ltd., the Harland Engineering Co. of Canada, Ltd., and Crompton Parkinson (Canada), Ltd.—will pool their resources and operate in this country as a unit.

These firms hitherto have been competing against each other as well as against other Canadian firms, thus making things all the harder for themselves as British manufacturers. In future they will be competing (chiefly) against other Canadian firms.

It is greatly to be hoped that this new venture will be successful. Certainly, by means of it, expenses can be reduced and better service can be given. It is no joke, so far as British trade is concerned, for each of several firms having branches here to send a man some hundreds of miles to a mine in the North, where perhaps the last 200 miles or so are covered by airplane (for lack of other means of transportation) and then for each of them to find that some Canadian or even a United States firm has secured the order.

A Possible Extension

The British firms comprising the new Canadian company represent a capitalisation of nearly £3,000,000; they have had branches in this country for from ten to twenty-two years, so that all of them may be expected to know what they are doing. It is believed that they intend, if this move in Canada proves to be satisfactory, to try similar measures in other parts of the Empire.

The company will have its head office in Montreal and a branch in Toronto. The officials will be as follows:—President and general manager, Mr. C. G. Abbey, now president of the Lancashire Dynamo & Crypto Co. of Canada, whose photograph appeared in the ELECTRICAL REVIEW of March 10th, page 362; vice-president and Ontario manager, Mr. B. M. Burt, director and general manager of the Harland Engineering Co. of Canada, Ltd.; director resident in England, Mr. S. A. Gaskell, vice-president and general manager of Bruce Peebles (Canada), Ltd.; and secretary-treasurer, Mr. S. E. Gladwell, now secretary-treasurer of Crompton Parkinson (Canada), Ltd.

These four firms, acting in concert, will be able to supply a very large range of manufactures, including fractional-horse-power motors, industrial motors and generators of all types, turbo-alternators, synchronous and static condensers, transformers, switchboards, rectifiers, and special drives such as those used for paper-making machinery. No doubt this new scheme will be watched carefully by other firms at home, and the writer, for one, hopes that its success will be such that other firms will join the organisation or group themselves together to form similar concerns.

A Rule Relaxed

It is of interest to note that the Board of Control of Toronto has recently decided that instead of requiring that materials used in civic contracts shall be made in Canada whenever possible they may be obtained within the Empire. Apparently this is one result of the Imperial Economic Conference held in Ottawa last summer; it will give British firms a little wider scope here.

New Books

Power Economy in the Factory. By J. C. TODMAN. Pp. 218; figs. 41. London: Sir Isaac Pitman. Price: 7s. 6d.

According to the sub-title, this is "a book for cost and works accountants." The author finds it impossible to enter into details; he says that the existence of inefficiencies in industry can be shown, their location indicated, "and the nature of the remedy suggested," but the last point is nowhere satisfactorily answered. The only chapter bearing directly upon the accountancy side occupies but nine pages.

Many of the definitions in the introductory chapters are loose and inaccurate. Few would agree with the author's statement that "the popular conception of the ampere is that it represents a quantity of electricity" (p. 32); nor would anyone approaching the subject for the first time find any satisfaction in the statement that "the electrical conductivity, usually for electrical purposes expressed as resistance (the inverse of conductivity), varies for different materials" (p. 36). In describing electrical generators the terms armature and rotor, field magnet, and stator are compared without any hint as to their customary specialised usage (p. 113). The only algebraical formula given in connexion with a.c. circuits is incorrect (p. 127), the root sign being taken outside the whole expression on the right-hand side, instead of the denominator only.

However, the book will be useful as an introduction to the fundamental principles of engineering practice to those having no acquaintance with these principles but desiring an indication of the possibilities of power economy in industry.

Wireless: Its Principles and Practice, by R. W. HUTCHINSON. Pp. 271; figs. 220. London: University Tutorial Press, Ltd. Price 3s. 6d.

The author, who was formerly principal of the Municipal Technical College, Smethwick, has used his teaching experience with success in the preparation of several textbooks on electricity, wireless, and television. This particular volume is really an elementary textbook on broadcast reception, as the space devoted to transmission is negligible and no information is given on commercial working. The title is, therefore, somewhat misleading.

The book is intended primarily for beginners who have no previous knowledge of electricity. Mathematics is avoided, and about a third of the book is devoted to the fundamentals of electricity so far as they affect wireless signalling. The remainder of the book consists of a concise, but simple, explanation of the fundamentals of wireless reception, and their up-to-date practical application to broadcast receiving circuits. There are, too, a few pages on transmission and on the principles of television. The volume should be useful to amateur wireless experimenters and students at technical classes.

Introduction to the Theory of A.C. Motors. By G. WINDRED. Pp. 59; figs. 21. London: Draughtsman Publishing Co. Price: 2s.

In studying this volume it is an advantage for the reader to possess some knowledge of the theoretical aspects of alternating currents. Some mathematics is necessarily involved, but this aspect of the subject has been reduced to a minimum, is of an elementary character, and readily mastered by the average student of electrical engineering. The author discusses those sections of a.c. circuit theory which are required in considering the behaviour of the various types of motors.

The practical unit of inductance is deduced from elementary principles, and forms of equations are given which detail a simple graphical construction by means of which the impedance may be calculated. In considering the practical methods which are applied in power factor improvement, prominence is given to a study of static condensers and synchronous motors. Mr. Windred's book is a timely and concise contribution to a rapidly developing subject, and should stimulate its readers to the study of more advanced work.

Economic Tables for Electrical Engineers. By D. J. BOLTON. Pp. 19. London: Chapman and Hall, Ltd. Price 1s. 6d.

These tables are intended to enable the purchaser to ascertain easily the cost of the running losses in a machine, which, added to the capital charges, give the really comparative costs of any apparatus. The tables show how to take account of

varying lines and rates of interest. The importance of the form factor of copper losses has been fully realised; as these are proportional to the square of the current, their load factor is lower than that of the load itself. There are some well-thought-out examples in the use of the tables, and the book should be a useful supplement to "Electrical Engineering Economics" by the same author.

* * *

Shorter Notices

"Verhalten keramischer Werkstoffe bei Zugdruck-Dauerbeanspruchung" ("Behaviour of Ceramic Materials under continued Alternating Tension Compression Stress"). By Dr. Ing. Fritz Heumann, Berlin: VDI-Verlag. Pp. 42; figs. 40 and 4 tables. This book contains a summary of the results of endurance tests carried out on ten porcelains of different make and composition, and continued up to ten million reversals under several loads in the neighbourhood of the breaking load.

"Statistical Review of Press Advertising." Pp. 144. London: Legion Publishing Co. Price 6s.—This publication, issued quarterly, analyses some £3,600,000 of displayed press advertising and covers the expenditure of more than 1,000 national advertisers. Among the subjects covered are accumulators, batteries, lamps, gramophones, radio, vacuum cleaners, and refrigerators.

"Street Traffic Flow," by Henry Watson. Pp. 395; figs. 89; tables 35. London: Chapman & Hall. Price 21s.—In this book the problems which the movements and direction of street traffic present are dealt with at length. Chapters are included on traffic light signal systems, co-ordination of crossing signals and the influence of trams on traffic flow, as well as a useful bibliography.

"Standard Handbook for Electrical Engineers." Editor: F. F. Fowle. Pp. 2,816; figs. 64; tables 458. London: McGraw Hill Publishing Company. Price 42s.—This very comprehensive work is divided into twenty-eight sections arranged in logical order, and written by a specialist. The indexing is very good, cross-references being made to all other parts of the book where the subject in question is treated. Sections on electric heating, melting, welding, &c., electron tubes and wave filters have been added.

The 1933 edition of the "British Plastics Year Book" (Plastics Press, 7s. 6d.) is now available. It contains 460 pages, and the sections on materials, plant, and products of the plastic industry have been enlarged.

Kinematograph Year Book, 1933. London: Odhams Press, Ltd. Price 10s., post free.—This annual contains facts and figures relative to every section of the trade, an innovation in this twentieth edition being an "easy section finder" which assists reference.

"Telephone Theory and Practice," by K. B. Miller. Vol. I, "Automatic Switching and Auxiliary Equipment." Pp. 494; figs. 287. Vol. II, "Manual Switching and Sub-station Equipment. Pp. 439; figs. 327. London. Price 30s. each volume.

"Chemical Wave Transmission in Nerve," by A. V. Hill. Pp. 68; figs. 13, plus references and index. Cambridge: University Press. 5s. net.

"Critical Speed of Shafts," by W. Roland Needham. Pp. 45; figs. 14. London: Draughtsman Publishing Co. Price 2s.

"*Mechanical World* Electrical Pocket Book." Pp. 337. Manchester: Emmott & Co., Ltd. Price 1s. 6d.—Fresh matter concerning the properties and performance of proprietary products has been added in this edition.

"Electric Wiring for Lighting and Power Installation." London: Chapman & Hall. Price 18s. 6d.

"Practical Electricity," by T. Croft. Price 18s. London: McGraw Hill Publishing Co.

"Modern Physics," by G. E. M. Jauncey. London: Chapman and Hall. Price 22s.

Parliamentary Notes

(BY OUR SPECIAL REPORTER)

DURING the debate on the Consolidated Fund Bill in the House of Commons on March 22nd, Mr. Chamberlain, the Chancellor of the Exchequer, referring to schemes for which Government expenditure might be required in aiding employment, said that the electrification of the railways was one of these. The Government was not against the electrification of railways, but the electrification of the suburban railways had been waiting for the passing of the London Passenger Transport Bill. Now that the way was clear, he supposed that the scheme for the electrification of those railways would proceed. If Government assistance was required, the Government would desire to see what the scheme was and whether it was necessary. It could not be said that the Government had put any obstacle in the way of procedure on schemes of that kind.

An Electricity Supply Bill

Lord Falmouth has introduced into the House of Lords a new Electricity (Supply) Bill. The second reading has been fixed for April 4th. The Bill contains clauses relating to the breaking-up of streets, charges for domestic fittings, the use for lighting energy supplied for power, stand-by supplies, and bylaws regarding installation material and workmanship.

The New-pattern Telephone

On March 27th Captain Cazalet asked the Postmaster-General whether he had been able to give favourable consideration to the question of reducing the charge for the new-pattern hand-microphone instrument.

Sir K. Wood replied that from the beginning of April he proposed to reduce the charge for the hand-microphone instrument. New renters would have the option of making a lump sum payment of 20s. or six quarterly payments of 4s. Subscribers already renting the instrument would be relieved of the present supplementary charge of 2s. a quarter as soon as the total of their payments for complete calendar quarters amounted to 24s.

A New Russian Wireless Station

On March 27th Mr. Hall-Caine asked the Postmaster-General if his attention had been called to the fact that Russia was proposing to use a 500-kW broadcasting station, whereas all the other European powers at the Madrid Conference agreed to a maximum of 100 to 120 kW; and whether Russia was a party to this agreement at Madrid.

Sir K. Wood said that the International Radiotelegraph Regulations did not prescribe any limit of power for broadcasting stations. It was, however, agreed in a special protocol, to which all the principal European countries, including Russia, were parties, that a broadcasting conference should be held in Switzerland in May next, which should deal with the allocation of wavelengths to broadcasting stations in Europe and the fixing of the power which such stations might use. The protocol contained a clause to the effect that the European conference should take as a guide a statement drawn up at Madrid which provided that, save in exceptional cases, the power used by a broadcasting station should not exceed 100 kW if it was working on a medium wavelength or 150 kW if it was working on a long wavelength.

In the Courts

IN the Chancery Division last week, Mr. Justice Bennett made a consent order at the instance of the Emkabe Radio Co., Ltd., for an injunction against the Telsen Electric Co., Ltd., to restrain the alleged infringement of the plaintiffs' registered trade mark "Astra." Mr. Lloyd Jacobs, for the plaintiffs, said that it had been agreed to treat the motion as the trial of the action, the defendants consenting to an injunction restraining them from using the words "Astral," "Astrala," or "Strala" for the purpose of advertising their apparatus. The defendants would pay the costs and an agreed sum for damages. Defendants retained a certain amount of apparatus, and plaintiffs were prepared to allow the defendants to sell them after they had been relabelled in the form approved.

An "Inventor" Sent to Prison

At the Torquay Police Court last week, Harry Smith, who claimed to have invented a means of obtaining electricity from the air, a machine for stopping motor vehicles and aircraft by means of an electric ray, a self-contained electrically driven motor car, electrically heated wallpaper, and to have drawn up schemes for the illumination of the Eiffel Tower and Sydney, New South Wales, and the electrification of railways in England, France, Germany, Italy, and Holland, was charged with obtaining money by false pretences from a medical doctor. In the course of the case it was stated that Smith had informed the doctor that "a satisfactory agreement had been arrived at with Mr. Selfridge concerning a grid electrical scheme and that the British Government would pay £500,000 for it." Smith was sentenced to six months' hard labour.

Block Battery Sales

In the Chancery Division last week, Mr. Justice Luxmoore granted an interim injunction restraining until trial or further order the Great International Sale & Exchange Stores, Ltd., Chiswick, W., from selling or offering for sale batteries made under letters patent belonging to Messrs. L. Fuller, G. J. Fuller, Andrew Fuller, and Edward William Fuller (which are known as Fuller block batteries) below the retail price licensed by the patentees. The defendants did not appear nor were they legally represented.

The Radiovisor Litigation

On March 27th, after a hearing lasting twenty-seven days, the Court of Appeal, consisting of Lords Justices Scrutton, Greer and Slesser, reserved judgment in the appeal of Radiovisor Foreign and Colonial, Ltd., from a judgment of Mr. Justice Lawrence in the King's Bench Division dismissing the action which it brought against Radiovisor Parent, Ltd., for £200,000 damages and the return of 100,000 £1 shares.

Business and Industrial Notes

The Week's Electrical Trade News from all Sources. Commercial and Industrial Developments, Business Changes, Market Prices for Materials, Trade Openings, New Publicity Literature, Liquidations, and Failures

The Easter Holidays

Advertisers are requested to note that owing to the Easter Holidays copy and blocks for our April 14th issue must reach our Advertisement Department by April 3rd, and for the April 21st issue by April 10th.

The E.D.A. Public Speaking Competition

A difficult task was given the judges at the finals of the British Electrical Development Association's Public Speaking Competition at the Caxton Hall, Westminster, last Friday. Throughout the contest the standard of speaking was very high, while the variety of the topics chosen and the different methods of treatment rendered comparison between the competitors no easy matter. Of the 160 original entrants the nine winners of the Area Competitions (three ladies and six men) were eligible to compete. The first places in both the ladies' and men's competitions were awarded to North-West Area competitors—Miss H. M. Lane, who spoke on "Electric Cooking—its Advantages," and Mr. E. Ewart, who chose "Domestic Refrigeration" for his subject. The runners-up were Miss L. E. Tucker (London and S.E. England Area: "The Advantages of Electric Cooking") and Miss E. Clapham (Northern Counties Area: "Jottings from My Notebook"); Mr. C. F. Mayson (London and S.E. England Area: "Electricity as a Heating Agent") and Mr. B. C. Robinson (South-West Area: "Electricity for Warmth and Comfort"). The judges were Lady Bethell, Lord Falmouth, and Mr. Hugh Royle (town clerk, Hammersmith), the chair being taken by Mr. J. C. Dalton (manager and secretary, County of London Electric Supply Co., Ltd.).

The Moscow Arrests

Although willing to release on bail Messrs. Thornton, Gregory and Cushney, three of the Metropolitan-Vickers Electrical Co.'s Moscow staff who have been arrested on charges of "sabotage," M. Vishinsky, the Soviet Chief Prosecutor, has refused the company's offer to provide bail for all its imprisoned employés. During the past few days Mr. Allan Monkhouse, the company's principal representative in Moscow, who is now on parole, has spent several hours under examination by M. Vishinsky, who has announced that the trial will probably begin early in April. It will be public and British lawyers will be allowed to be present, although they will not be permitted to take part in the proceedings.

An Electrical Jubilee

At the annual general meeting of Messrs. A. P. Lundberg & Sons, Ltd., the chairman, Mr. G. C. Lundberg, reminded those present that the company had recently completed its jubilee. He said that the firm, which was established in Clerkenwell by the late Mr. A. P. Lundberg in 1882, was among the few pioneer manufacturers of electrical accessories in the United Kingdom when the requirements, chiefly for lighting purposes, had to be designed as the need arose. The company could pride itself on being the originator of numerous standard articles now in general use. The reputation enjoyed by the company was world wide as it had always been credited with the manufacture of reliably built goods.

A New D.O.T. Publication

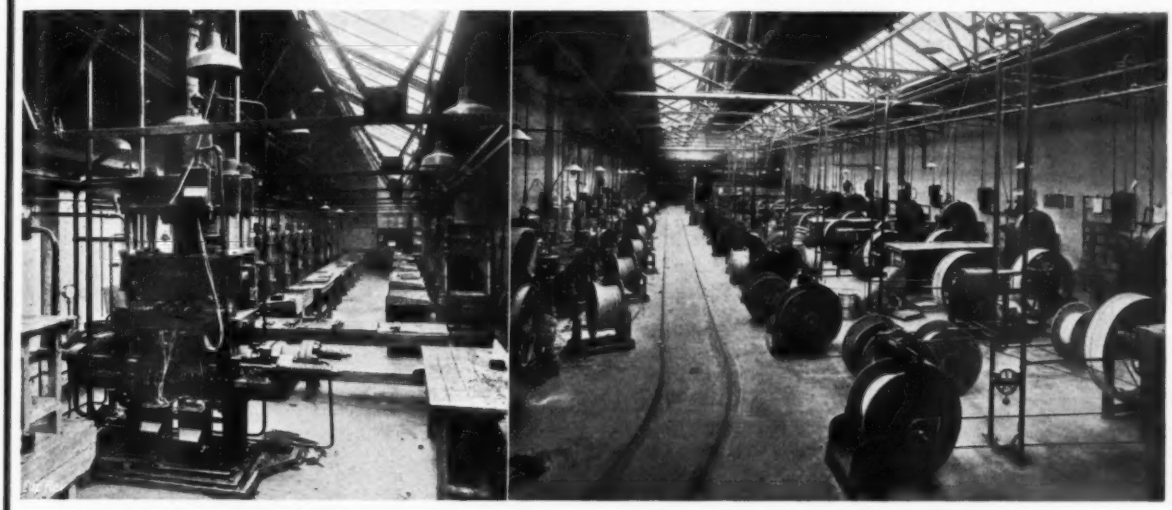
A report on the economic conditions in Guatemala, Honduras and Nicaragua has been published by the Department of Overseas Trade.

Wages in the Cable-making Industry

The Joint Industrial Council for the Electrical Cable-making Industry announces that the March 1st cost-of-living figure (39 per cent. above the 1914 level) does not involve any alteration in wages on the third pay-day in April.

Reduction of Electricians' Wages

The National Federated Electrical Association announces that the variation in the cost of living justifies further reductions ranging from ¼d. to 1d. in the basic hourly rates of wages fixed in April, 1921. The new rates, which will come into effect on the second pay-day in April and will remain in force till the first pay-day in April, 1934, are as follows: Grade A, 1s. 7¾d. an hour (subject to an addition of 5 per cent., making a total of 1s. 8¾d. an hour); grade B, 1s. 5¾d.; grade C, 1s. 4¼d.; and grade D, 1s. 3¼d. The corresponding rate for mates under the London agreement will be 1s. 4¼d. an hour.



Views of Messrs. Ward & Goldstone's new moulding press and rubber cable departments

Electrical Exhibits at Glasgow

At the recent Bakers', Grocers', Confectioners' and Allied Trades Exhibition, Kelvin Hall, Glasgow, the General Electric Co., Ltd., demonstrated the use of electricity in the production of foodstuffs in the kitchen. In a model bakery there were two "Magnet" electric baking ovens and two electric scone plates. "Magnet" baking ovens were also shown by Messrs. Debreyn and Messrs. Langs, and demonstrations were given daily, among other things, of washing, ironing, cleaning, and polishing by electricity. Aids to selling were shown in the form of the Claudegen "Ripple" ring and "Cleon" window signs. Another section of the stand was devoted to the company's "Bakelite" torches.

New Municipal Showrooms

Southend-on-Sea Corporation is to lease premises at 171, Hamlet Court Road, for use as an electrical demonstration room and showroom.

The Lowestoft Corporation Electricity Department is opening hiring department showrooms in London Road North, on April 3rd.

British Plastic Moulding Trade Association

Congratulations on the remarkable progress made by the Association during the short period of its existence were tendered by H.R.H. Prince George at the annual luncheon of the British Plastic Moulding Trade Association held at the Savoy Hotel, London, on Thursday last week. Speaking of the future of the industry, Captain J. W. Barber, the chairman, detailed some of the innumerable applications of plastic mouldings and said that manufacturers were fully prepared to meet the revival of trade which must come eventually. Sir Harry McGowan, chairman of Imperial Chemical Industries, Ltd., who responded to the toast of the guests, said that, notwithstanding recent achievements, the industry was still only on the threshold of discoveries, and few people realised how wide was the range of domestic needs for which mouldings could cater. Plastic materials were not only non-inflammable and non-corrosive, but also non-conductive to heat or electricity. They could be produced in all colours, and, while they were lighter than metal, their strength compared favourably when taken on a weight for weight basis; they were also much less resonant conductors of sound. It was difficult to see any limits for future technical poten-

tialities, but the Association represented the first step towards the full organisation of the industry. Ample labour, cheap money, and cheap material were all available—a combination of factors which might not occur for years to come once the world's trade started on the upward trend again.

The Kelvinator Convention

Kelvinator, Ltd., held its annual convention at the Wharncliffe Rooms last Tuesday. Very satisfactory progress was reported by the company, sales showing an increase of over 30 per cent. on the previous year. A range of new models is being brought out and these will be described in a forthcoming issue.

Social Event

A fancy dress dance, organised by the employés of the Z Electric Lamp & Supplies Co., Ltd., was held recently at the Royal Hotel, Woburn Place, W.C., and was attended by nearly 200 members and friends.

The Peruvian Radio Market

A Department of Overseas Trade report on the market for radio apparatus in Peru states that imports of this class of goods from the United Kingdom is still comparatively small, the United States and, to a smaller extent, Holland being the principal supplying countries.

Neon Lighting at a Cinema

The neon display on the front of the new Elephant and Castle Cinema, London, was executed by the Pearce Sign Works, and comprises some 800 ft. of red, green and blue tubing, which forms straight and curved outlining to the windows and ornamental features for the building and canopy. The

The neon lighting at the new Elephant and Castle Cinema, London, cannot fail to attract attention

pictorial design of an elephant in red tubing, a castle in blue, and foliage in green is most effective. The elephant is animated in a unique manner, the trunk being thrown upward as though trumpeting, while the ears flap and the tail moves. The whole installation is operated by twenty-eight transformers, the tubing being mounted direct upon the stone building.

New Czechoslovakian Lamp Tax

The Czechoslovakian Government has imposed a "consumption tax" on electric lamps and light tubes as from March 1st. The rate of tax on neon tubes and arc-lamp carbons is 25 per cent. of the price, while the tax on filament lamps is graded according to their size, *e.g.*, 2.20 kronen for a 60-W lamp and 10 kronen for a 100-W lamp.

A Plastics Exhibition

The Society of Chemical Industry, in conjunction with the British Plastic Moulding Trade Association and the Department of Scientific and Industrial Research, has arranged a plastics industrial exhibition in the Science Museum, South Kensington. This exhibition, said to be the first of its kind, will be opened on April 5th. It is to cover approximately 10,000 sq. ft. of floor space, and on the two floors which it will occupy every branch of the industry will be embraced, from raw materials to intermediate products and the finished article. There is to be a large section of the exhibition devoted to groups of moulded products, not only the more common objects such as telephones and unbreakable domestic appliances, but also a great variety of newer applications, of which electrical instruments, door furniture, house meters, and automatic fire alarms form typical examples. Nearly seventy-five industries will be represented, and throughout the exhibition, which is to last several months, there will be a series of lectures by experts The first is by Mr. H. V. Potter, chairman of the Plastics Group of the Society of Chemical Industry, on April 12th, on "Plastics and What They Are." This will be followed by many others covering such subjects as shellac and natural resin types; celluloid and casein types; urea formaldehyde types; plastics and the fabricator; the use of plastics in the paint industry, architecture, and dentistry; cellulose esters and ethers; and the use of plastics in the electrical industry. This last is a paper by Mr. K. G. Maxwell.

Changes of Name

Messrs. T. A. Keating, Ltd., electrical and wireless engineers, 186, Westcombe Hill, Blackheath, S.E.3, have changed their name to Keating & Miskin, Ltd., while the title of Whitworth Electrical Repairs, Ltd., rear of 15, Clarendon Road, Hornsey, N.8, has been altered to Latham Productions, Ltd.

Progress at Prescot

British Insulated Cables, Ltd., inform us that their business in moulded insulation improved considerably during 1932. They have had a considerable increase in inquiries and orders, many of these being from new customers; the number of pieces manufactured in 1932 was 25 per cent. greater than in the preceding year. It is believed that a large proportion of these new orders are from customers who previously purchased abroad. A recent development at the company's Prescot works is the installation of a new strip mill with flattening and cutting-off machines working in conjunction with it. The company can now supply copper or aluminium sheets in coil form in widths up to 24 in. and in gauges from 18 to 30 s.w.g. Another development is the manufacture of extruded lead strip in widths up to 15 in. and in any required length.

The Manchester Engineers' Club

The twentieth annual meeting of the Engineers' Club, Manchester, was held on Tuesday. Although there has been a falling-off in membership due to the general depression, it is satisfactory to learn that the loss on the year's working is less than £300 which is amply covered by reserves. One of the great difficulties which all institutions of this kind are beset with at the present time is the lack of the younger men to fill the gaps in the membership left by the falling out of the seniors. In order to remedy this the Committee has decided to "catch them young" by throwing open its doors to junior members who will be admitted at a much reduced subscription until they reach the age of twenty-five years.

The Manufacturers' Agents' Association

The annual general meeting of the Manufacturers' Agents' Association of Great Britain and Ireland was held last week in London. There was a good attendance, Mr. John Joy, the president, taking the chair.

A Photo-electric Exhibition

A special exhibition devoted to photo-electric cells and their practical applications was opened at the Science Museum, South Kensington, on March 25th, and will remain open for three months. Besides exhibits showing the construction of the three main types of light-sensitive cell, simple working experiments have been arranged to demonstrate their properties and to illustrate some of the methods of amplifying the small currents yielded by the cells under varying illuminations. The practical applications of photo-electric cells can roughly be classified into those involving only the detection of light and those involving its measurement. The first class is illustrated in the exhibition by a number of working models showing the use of the cells, for instance, for counting small packages on a conveyor belt, and in burglar alarms, while, as an illustration of the way in which a comparatively large amount of power can be controlled, there is a door which is automatically opened when a beam of light is interrupted by the visitor.

Some applications involving the measurement of light intensity include the measurement of daylight and indoor lighting, the automatic switching of street lamps, and the measurement of the density of factory smoke, while the ability of photo-electric cells to respond to rapidly fluctuating light is shown by their well-known applications in the reproduction of sound from sound-films, and their use in television.

The exhibits have been lent by the Western Electric Co., the Westinghouse Brake & Saxby Signal Co., the British Thomson-Houston Co., the General Electric Co., Ltd., the Marconi Co., Barr & Stroud, Ltd., the P.O. Engineering Research Station, Mr. E. Bolton King, the Oxford Instrument Co., the Cambridge Instrument Co., Mr. W. R. G. Atkins, H. Tinsley & Co., W. Watson & Sons, Ltd., Mr. G. M. B. Dobson, and Radiovisor, Ltd.

Driving Farm Machinery

One of the problems of adapting an electric drive to agricultural machinery is the low speed at which many farm machines operate. This difficulty has been accentuated in several areas by the changing over of supply systems from 25 and 40 cycles to the national standard of 50 cycles. Mr. H. D. Phelps, agricultural engineer, North-Eastern Electric Supply Co., Ltd., has recently evolved a satisfactory way of converting hand-operated turnip cutters and potato graders to electric drive. A 1-h.p. single-phase repulsion motor is used for both purposes, being simply lifted from one machine to the other. Two long wooden arms are fixed to the frame of the turnip cutter, so that the machine can easily be carried by two men, and on this the motor is mounted. A 2¼-in. vee

pulley on the motor, fitted with three vee ropes manufactured by Messrs. Smith & Grace, drives on to the machine pulley, which is 40 in. in dia. and has a 3-in. face. The driven pulley of the potato grader is 22 in. dia. by 3-in. face and shorter vee ropes are used. Reyrolle plugs and 20 yd. of 3-core cab-tyre cable are used for providing supply from the farmyard circuits, so that the equipment can be operated at several different points on the farm premises. The total cost of the equipment, including a new pulley for each machine, is about £15, and compares favourably both in capital or running costs with existing power alternatives, while it possesses, at the same time, greater flexibility and lower maintenance charges.

Radio Census of Production

A new trading record was set up by the radio industry in 1932, according to a statistical survey carried out by the *Wireless & Gramophone Trader*. The gross turnover for the year at retail values is given as £36,627,425, of which £4,000,000 represents imported goods. There were 1,436,849 factory-made receivers of all classes sold during the year, representing a cash value of £19,323,198, while other important figures are £9,000,000 for accumulators and batteries, £5,000,000 for components and accessories, and £2,854,425 for valves (apart from those supplied in sets). New listeners numbering 600,000 bought manufactured receivers, the remaining 300,000 "new" licences being made up of home constructors, "pirates" discovered by the Post Office drive last autumn, and "coupon" gift sets, which alone totalled 120,000. It is interesting to note that while radio prices declined during 1932 many more people purchased higher-class sets, with the result that the year's trading, though showing an increase of 170,000 in set sales, brought in £7,000,000 additional cash turnover.

Trade Announcements

Switchgear & Cowans, Ltd., have appointed Mr. A. Manighetti, A.M.I.E.E., as their resident representative for the Midlands and South-West England as from April 1st. His address is 93, Ravenhurst Road, Harborne, Birmingham.

Messrs. Colmore, 85, Station Street, Birmingham, are acting as distributors in the Midlands of the new "Prestcold" refrigerator.

Messrs. Baxter & Caunter, Ltd., have been appointed sole agents for London, the South and South-East Counties, for the sale of "Raytonic" fires manufactured by the Raytonic Heating & Engineering Co.

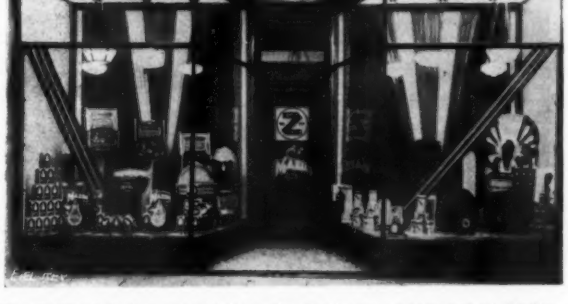
British National Electrics, Ltd., has removed to 5A, Berners Street, Oxford Street, W.1.

Price Reduction

The Hotpoint Electric Appliance Co., Ltd., announces a reduction in the price of the "Peerless" toaster from 20s. to 17s. 6d.

A New Derby Showroom

The accompanying illustration shows the new radio and electrical showroom which Z Electric Lamps and Supplies Co., Ltd., have just opened at 47, Queen Street, Derby. It is under



The Z Electric Lamp and Supplies Co.'s new premises at Derby

the management of Mr. S. Attenborough; the district manager is Mr. D. J. Crawford, 48, Friar Lane, Nottingham.

Recent Contracts

Standard Switchgear, Ltd., has secured an order for the whole of the 33-kV switches and fuses connected with the electrification of the Isle of Man. Although this company enlarged its factory last year, the large demand for complete sub-station equipments, ring openers, and kiosks has necessitated the consideration of further extensions.

Two new telephone exchanges, manufactured and installed for the General Post Office by Standard Telephones & Cables, Ltd., have been put into service this month. These are the Terminus exchange, which provides equipment for 4,920 subscribers; and the other is the Valentine exchange, Ilford, providing equipment for 4,100 subscribers. Both these equipments are of the regular step-by-step director type, as used in the London area.

A Birmingham Exhibit

The Birmingham Corporation Electric Supply Department has again a large stand at the annual National Trades Exhibition, which is being held in Bingley Hall, Birmingham. The stand, a section of which is shown in the accompanying

A section of Birmingham Electricity Supply Department's exhibit

illustration, contains a selection of lighting fittings, cookers, refrigerators, washing machines, boilers, fires, and other electrical labour-saving appliances, and has attracted a good deal of attention.

For Sale

Second-hand oil and chemical plant, including refrigerators, coolers, hydraulic presses, &c., is offered for sale by Scottish Oils, Ltd.

Gloucester Transport Department has tramway poles for sale. (See our classified advertisements.)

Prices of Materials

The following prices are only general, and they may vary according to quantities and other circumstances:—

OHEMICALS, ETC.	Price March 29th.	Fortnight's Inc. or Dec.
a Acid, Oxalic ... ... per cwt.	50s.	—
a Ammoniac, Sal ... ... per ton	£40	—
a Ammonia, Muriate (large crystal) ... ,,	£38	—
a Borax ... ... ,,	£17	—
a Copper, Sulphate ... ... ,,	£19 15s.	—
a Potash, Chlorate ... ... per lb.	3½d. to 4½d.	—
a ,, Perchlorate ... ... ,,	6d.	—
a Shellac T.N. ... ... per cwt.	£3	—
a Sulphur Commercial... ... ... per ton	£11	—
a ,, Roll ... ... ,,	£11	—
a Soda Chlorate ... ... per lb.	3½d. to 3¾d.	—
a ,, Crystals ... ... per ton	£5 to £5 5s.	—
a Sodium Bichromate, casks ... ... per lb.	4d.	—
METALS, ETC.		
b Aluminium, Ingots ... ... per ton	£100 to £105	—
b ,, Wire ... ... per lb.	1/1 to 1/9	—
b ,, Sheet and Foil ... ,,	1/2 to 2/9	—
p Babbits Metal and Anti-friction Metals—		
Grade I ... ... per ton net	£141	—
Grade II ... ... ,,	£100	£1 inc.
Grade III ... ... ,,	£51	—
c Brass (rolled metal 2" to 12" basis)... per lb.	7d.	—
c ,, Tubes (solid drawn) ... ... ,,	8¾d. to 9d.	—
c ,, Wire, basis ... ... ,,	7¼d.	—
c Copper Tubes (solid drawn)... ... ,,	9¼d.	—
g ,, Bars (best selected)... ... per ton	£61	—
g ,, Sheet ... ... ,,		
g ,, Rod ... ... ,,		
d ,, (Electrolytic) Bars ... ... ,,	£31 5s.	—
d ,, ,, Sheets ... ,,	£64	—
d ,, ,, Wire Rods ... ,,	£43	5s. inc.
d ,, ,, H.C. Wire ... per lb.	6¾d.	¼d. dec.
f Ebonite Rod ... ... ,,	1/3 to 1/6	—
f ,, Sheet ... ... ,,	1/3 to 1/6	—
m German Silver Wire ... ... ,,	2/2	—
h Gutta-percha, fine ... ... ,,	nom.	—
h India-rubber, Para fine ... ... ,,	4¼d.	¼d. dec.
i Iron, Pig (Cleveland No. 3)... ... per ton	£2/6	—
i ,, Wire, galv. No. 1, P.O. qual. ,,	£20	—
g Lead, English pig ... ... ,,	£12	10s. dec.
g Mercury ... ... per bot.	£9 to £9 10s.	
e Mica (in original cases) small ... per lb.	6d. to 3/6	—
e ,, ,, medium ... ,,	4/– to 8/–	—
e ,, ,, large ... ,,	8/6 to 17/6 & up	—
p Phosphor Bronze, plain castings ... ,,	1/1	—
p ,, ,, drawn bars & rods ,,	10¼d.	—
p ,, ,, rolled strip & sheet ,,	10¼d.	—
p ,, ,, wire ... ... ,,	11¼d.	—
o Platinum ... ... per oz.	£7 10s.	10s. inc.
d Silicium Bronze Wire ... ... per lb.	8¼d.	¼d. inc.
r Steel, magnet, in bars ... ... ,,	7¼d.	—
g Tin, Block (English)... ... ... per ton	£151 to £153	£1 inc.
n ,, Wire, Nos. 1 to 16 ... ... per lb.	2/11	—

Quotations supplied by:—

a G. Boor & Co.
b The British Aluminium Co.,Ltd.
c Thos. Bolton & Sons, Ltd.
d Frederick Smith & Co.
e F. Wiggins & Sons.
f India-Rubber, Gutta Percha and Telegraph Works Co., Ltd.
g James & Shakespeare.
h Edward Till & Co.
i Bolling & Lowe.
l Richard Johnson & Nephew, Ltd.
m P. Ormiston & Sons.
o Johnson, Matthey & Co.
p C. Clifford & Sons, Ltd.
r W. F. Dennis & Co.

New Catalogues and Lists

Hart Accumulator Co., Ltd., Marshgate Lane, Stratford, E.15.—A leaflet entitled "Safety Lighting in Cinemas with Hart Storage Batteries."

Thos. W. Ward, Ltd., Albion Works, Sheffield.—Leaflets Nos. C820 and 824 relating respectively to general electrical equipment and "Easipush" sack trucks.

Marryat & Scott, Ltd., 75, Clerkenwell Road, E.C.1.—An illustrated brochure describing the lift at Westminster Cathedral, which is believed to be the highest in Europe.

R. M. Catterson-Smith, Wembley.—A folder giving details of a new electric fire of unusual design.

Ferguson Pailin, Ltd., Higher Openshaw, Manchester.—Several leaflets dealing with circuit breakers, cross jet explosion arc control devices, and manual operating mechanism for oil circuit breakers, oil immersed disconnecting switches, &c.

Peerless Electrical Manufacturing Co., Ltd., 320-324, Euston Road, N.W.1.—A folder giving particulars of the "Peerless" oven.

Siemens Electric Lamps & Supplies, Ltd., 38-39, Upper Thames Street, E.C.4.—A "Full-o'-Power" radio battery cut-out showcard.

Burne-Jones & Co., Ltd., 296, Borough High Street, S.E.1.—A leaflet on the "Magnum" superhet short-wave adaptor.

National Gas & Oil Engine Co., Ltd., Ashton-under-Lyne.—The March issue of the "National Bulletin" dealing with small alternator sets, &c.

Switchgear & Cowans, Ltd., Elsinore Road, Old Trafford, Manchester.—Catalogue section No. 23 on internal isolation switchgear (Whitehead system).

Negretti & Zambra, 38, Holborn Viaduct, E.C.—Lists Nos. G.15 and T. 22 and 24, relating respectively to "Barnbury" pressure recorders, multipoint recording pyrometers, and "Mersteel" temperature recorders.

L.E.S. Distributors, Ltd., 15-16, Alfred Place, Tottenham Court Road, W.C.1.—A 137-page catalogue of electrical apparatus and material for industrial purposes.

S. Wolf & Co., Ltd., 115, Southwark Street, Blackfriars Bridge, S.E.1.—A list illustrating a motor-car engine service kit.

Marelli & Co., Ltd., 19 and 20, Garlick Hill, Queen Victoria Street, E.C.4.—List No. PIV.25 giving particulars of small domestic centrifugal pumping sets.

Bankruptcy Proceedings

J. Harris (trading as John Harris & Co.), dealers in electrical fittings, &c.—The public examination was to be held yesterday at Bankruptcy Buildings, Carey Street, upon a statement of affairs which showed liabilities of £974 and assets of £633, leaving a deficiency of £341. The debtor commenced business in 1931 as a general merchant in electrical, steam, and water fittings, and traded at 1A, Gage Street, Queen's Square, W.C., under the style of "Stewart Lee & Co. (London)," until about September, 1932, and subsequently under the style of "John Harris & Co. (London)" until November 25th, 1932, when, as he was in financial difficulties, a meeting of his creditors was held, and he executed a deed of assignment. He was adjudged bankrupt on January 31st, 1931. He attributes his insolvency to bad debts, to loss caused by the fall in the value of the £, and to tariffs imposed on imported goods.

J. W. White, radio and electrical engineer, 32, Castledene Road, Parkstone, Dorset.—The application for discharge was heard recently at the Law Courts, Bournemouth. It was reported that the receiving order was made in November, 1930. The Official Receiver said that a first and final dividend of 1s. 10d. in the £ had been paid on proofs for £1,160. The discharge was granted subject to twelve months' suspension.

T. E. L. Martin (trading as "Martin's"), wireless dealer, Kennington Road, S.E.—The public examination was held on March 24th at the London Bankruptcy Court, the accounts showing liabilities of £559 against assets of £18. The failure was attributed to trade depression, mainly caused by customers leaving the district, and also to his profits having been inadequate to meet expenses and drawings. The examination was concluded.

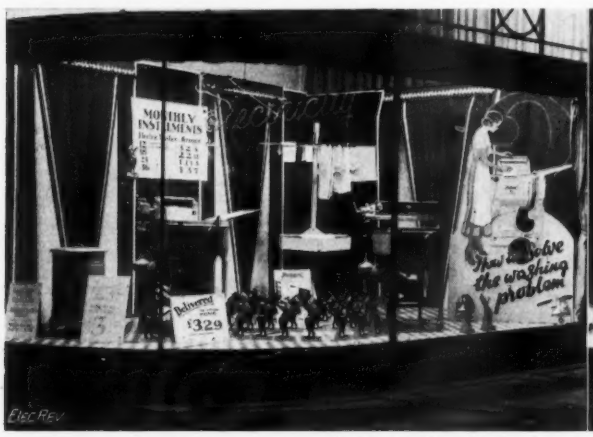
H. H. Edwards, electrical engineer, 26, Churchfields, Wellington.—Receiving order made March 16th on debtor's own petition.

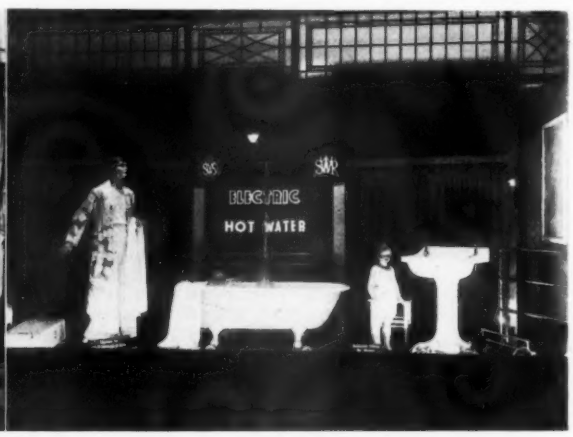
J. K. Gardner, electrical engineer, 52, Bell Street, Henley-on-Thames.—Application for discharge to be heard at the Assize Courts, Reading, on April 27th.

M. Haar (Fleet Electric Service), electrical engineer, 36, Hurstwood Road, Golders Green, N.W.11.—Discharge suspended for eighteen months until August 23rd, 1934.

Company Liquidations

Brownie Wireless of Great Britain, Ltd., Nelson Street Works, Camden Town, London, N.W.—The statutory meeting of creditors was held on March 27th at the Cannon Street Hotel, London, when the statement of affairs showed liabilities of £26,211, all due to unsecured creditors, and assets of £12,994. After deducting £6,967 for fully secured creditors and £981 for preferential claims, the net assets were £5,046, leaving a deficiency of £21,165 as regarded the creditors. The issued capital of the company amounted to £9,720, making a total deficiency of £30,885. The above figures were computed on the assumption that the business was being discontinued and the assets realised at a break-up value. The radio section had been closed entirely but a receiver was temporarily carrying on the moulding section with a view to its sale as a going concern. Captain Barber, who occupied the chair, stated that Mr. Foster, of Messrs. Lord, Foster & Co., who was the receiver for the debenture holders, had been nominated as liquidator at a meeting of the shareholders that morning. A creditor asked why liquidation had taken place when a scheme had been agreed to. Capt. Barber said that one reason was that one of the creditors had issued a writ and had obtained judgment, and another that the bank had appointed a receiver. The scheme had taken some little time to prepare and everything was ready, but the radio business had gone from bad to worse, and the board had reported to the committee of inspection that it would be in the interests of creditors to shut down that department entirely. A resolution was passed appointing Mr. Foster as liquidator with a committee of inspection.





In connection with a fortnight's demonstration of the Hotpoint washing machine the Croydon Electricity Department arranged the interesting window display on the left. Our right-hand illustration shows a bathroom appliance display at the Hereford showroom of the S.W. & S. Electric Power Co.

Radio-Tricity, Ltd., Edward Street and Baker Street, Brighton.—At a meeting of the creditors held on March 22nd at 150, North Street, Brighton, a statement of affairs was submitted which showed liabilities of £1,002, of which £690 was due to the trade. After allowing £27 for preferential claims, the net assets were £213, leaving a deficiency of £789. Resolutions were passed confirming the voluntary liquidation of the company with Mr. P. Friend James as liquidator. A committee was also appointed, consisting of Mr. A. E. Orbell and the representatives of Messrs. Ellis & Mort, Ltd., and the Brighton Radio Stores.

This attractive "Premier" display was recently to be seen in the Birmingham Electricity Showrooms

Wynne Battery Co., Ltd.—Winding up voluntarily. Liquidator, Mr. H. B. Jones, Somerset House, Blagrave Street, Reading.

Radio Electric Lamp Co., Ltd.—Particulars of claims by April 30 to the liquidator, Mr. J. E. Wright, Clayton Road, Hayes, Middlesex.

Dissolution of Partnership

Bedford & Roberts, electrical engineers, 10-12, Park Crescent Place, Brighton.—Messrs. T. C. Roberts and M. R. B. Partington have dissolved partnership Mr. Partington will attend to debts and carry on the business.

Electricity Supply

Lighting, Domestic, Power

Bexhill.—EXTENSIONS.—The Electricity Committee recommends the carrying out of the following works: The erection of a 200-kW sub-station (£3,185); change-over to a.c. in Hooe Road, Whydown, and Pear Tree Lane (£1,740); new cable to relieve Sutherland Avenue sub-station (£335); new cable from the feeder in Wickham Avenue (£161).

PUMPING PLANT.—The Corporation water engineer reports that the first stage of the scheme of development at Cowbeech is nearing completion and that it is desirable that the first part of the second section of the scheme should now be proceeded with as follows: 150-b.h.p. crude-oil engine, generator, and switch panel (£1,535); surface pump, motor and switch control panel (£303); two borehole pumps, motors and switch control panels (£1,390) and cables (£230). It is recommended that tenders shall be invited from six selected firms for the necessary plant.

Blackburn.—PUBLIC LIGHTING.—The Corporation is agreed about the need for improved illumination of the town's principal thoroughfares, and a report on the subject will shortly be considered.

Blackpool.—ALL-IN TARIFF ALTERATIONS.—In future the minimum payment under the all-in tariff will be 10s. per quarter.

Brampton.—SUPPLY TO WALTON.—The Rural District Council is to press its application for an electricity supply for Walton by means of an extension from Irthington.

Brierfield.—MARSDEN HEIGHT SUPPLIES.—From to-morrow Brierfield will provide electricity for the Marsden Heights district, which is now supplied by Nelson Corporation.

Broadwood.—SPECIAL ORDER.—The Rural District Council has given its consent to an application by the West Devon Electricity Co., Ltd., for a Special Order to supply electricity throughout its area.

Bromley (Kent).—EXTENSIONS.—The Town Council has decided to extend the mains in the Kinnaird Park and Burnt Ash Lane areas, Bromley South, and Chislehurst Road at a cost of £4,123. There are also to be extensions at a new road off Southborough, on the Grove Park Heights Estate, and in Victoria Road and Foxbury Road.

Buxton.—SPECIAL ORDER.—The Electricity Commissioners have submitted to the Minister of Transport for confirmation a Special Order made by them authorising the Corporation to supply electricity in part of the borough and part of the rural district of Chapel-en-le-Frith.

Canada.—EXPORT OF POWER.—According to *The Times*, a Bill has been introduced in the Quebec Legislature permitting the export of hydro-electric power to the United States. This marks a reversal of the policy of the Taschereau Administration, which has consistently opposed such export. The new measure permits an annual export of 300,000 h.p., and provides for an export levy of $2 per h.p. One reason for the change of policy is the desire to relieve the present glut of power which exists in the Montreal area, which will be aggravated when the full output of the Beauharnois Power Corporation becomes available.

Chelmsford.—LIGHTING OF INSTITUTION.—Essex Public Assistance Committee has decided to have electric lighting installed in place of gas in the old portion of the wards at Chelmsford Institution at an estimated cost of £110.

Colchester.—OVERHEAD LINES INQUIRY.—Mr. F. Gordon Tucker held a Ministry of Transport inquiry on March 22nd regarding an application by the Corporation for sanction to erect an overhead line in Seaview Road, West Mersea. The Ministry's decision will be communicated to the Corporation in due course.

Coventry.—LOAN.—The Electricity Committee is to seek sanction to the borrowing of £107,330 for mains extensions and equipment.

Dorchester.—GRID SUPPLIES.—The Electricity Committee has received a report from the borough electrical engineer upon the question of obtaining a supply of electrical energy from the Central Electricity Board. The Committee is of opinion that it is not a practical proposition to retain the present electricity works as a distributing centre, and is to ask the Markets Committee to allow the Electricity Department to take over the premises in Trinity Street recently known as the Horse Repository for conversion into a transforming station. On receiving the Council's approval to this suggestion, the electrical engineer will prepare a scheme for the premises, the rear of which would be utilised for transformers, switchgear, &c., and the front for offices and possibly a showroom.

Dornoch.—NEW SUPPLY SCHEME INAUGURATED.—A supply of electricity provided by the Ross-shire Electric Supply Co., Ltd., was switched on by Mrs. Murray, wife of the Provost, on March 22nd.

Douglas (I.O.M.).—LOAN.—The Electricity Department proposes to borrow £5,250 for capital expenditure on l.p. mains, services, and public lamps during the coming year.

Droxford.—ELECTRICITY FOR COUNCIL HOUSES.—The Rural District Council has consented to electricity being installed at Council houses at Bishop's Waltham at the expense of the tenants, who are to pay the supply company 6d. per week until the installation costs are defrayed.

Dundee.—CAROLINA PORT EMPLOYÉS.—In consequence of the city now taking grid supplies some of the employés at the Corporation's generating station at Carolina Port are to be transferred to other sections of the Electricity Department. Several have to be compensated for a reduction in wages, and the Electricity Committee has agreed to defer consideration of the matter until the reorganisation at Carolina Port is completed.

Falkirk.—AGREEMENT REACHED.—The controversy between the Corporation and the Electricity Commissioners regarding local electricity supply as against supply from the grid has ended in an amicable arrangement whereby Falkirk's requirements surplus to the generating capacity of the Corporation's existing plant will be purchased from the Central Electricity Board. It will be recalled that there was a four days' inquiry last summer following an application by the Town Council for permission to install a new 5,000-kW turbo-generator set, &c. The Commissioners refused the application on national grounds, particularly in view of operations of the Central Board's scheme The alternative to an extension of the undertaking

Floodlighting has now found its way to the ski-ing ground of the Oslo Ski-ing Association on the Mittstuschanze, where it was recently officially put into service. The installation was planned and erected by Philips Lamps, Ltd.

was an offer by the Board to supply the whole requirements from the grid and completely shut down the Falkirk station. It was argued by the Corporation that the Electricity Department burned all the refuse fuel from the salvage works, and that if the station was closed down the whole of the salvage plant would be rendered useless. The Council would thereby lose the revenue obtained from the refuse, and there would be an added burden in dealing with the refuse. This, it was held, would have amounted to a direct loss of more than £1,000 annually.

Fleetwood.—REDUCED CHARGES LIKELY.—At a recent meeting of the Urban District Council, Councillor C. Saer, chairman of the Electricity Committee, said that in spite of the recent reductions in tariffs the prospects were that the Department would record a profit this year of between £9,000 and £10,000. The question of the further revision of prices had been referred to the sub-committee for report. The engineer thought it possible to take ½d. per kWh off the lighting charge and add another ¼d. to the discount on slot meters, and also to reduce the "unit" charge on the rateable value system from ¼d. in the summer months and ¾d. in the winter to ½d. all the year round. It might be possible to lower the rentals on apparatus, and it was also intended to reduce the price for motive power and the scale for larger users.

Fort William.—WIRING SYSTEM CAUSES TROUBLE.—A meeting of electricity consumers was held last week following the receipt of a letter from the Fort William Electric Lighting Co., Ltd., stating that owing to damage, due to leakage, to the underground plant of the local post office, the Electricity Commissioners found it necessary to withdraw the approval of the Board of Trade, granted in 1897, to the present system of one insulated and one bare wire. The consumers maintain that the present bare wire system for 150 V d.c. is by far the safest, and point to the fact that during the last forty years not a single instance of fire from wiring has occurred. The letter from the supply company pointed out that unless a new system was installed throughout by the end of August it would

not be permissible for it to continue to supply. The view expressed at the meeting was that the Post Office authorities were taking an unfair advantage of the consumer, as the cost of insulating the affected post office cables against leakage was a minor affair, involving £100 or £200, whereas the cost to the consumers of rewiring their premises would probably run into several thousand pounds. The meeting agreed to protest to the Secretary of State for Scotland and the local M.P.s.

Glasgow.—THE DALMARNOCK STATION.—The Central Electricity Board has modified its decision to restrict the production of electricity in the Dalmarnock power station of the Corporation. The Board, it will be remembered, intimated recently that production at Dalmarnock should be restricted. The Electricity Committee protested, contending that the Board's decision penalised municipal enterprise for the benefit of private companies connected with the grid, and it was stated that the restriction of production at Dalmarnock would cause a serious financial loss to the Corporation. The Board, following a conference with the representatives of the Electricity Committee, now proposes to allow Dalmarnock station to generate electricity every alternate week-end, while there is also a concession regarding evening production.

Greenock.—EXTENSIONS.—The Corporation is to enter into an agreement with Messrs. Smith & Co., Fyfe Park, Port Glasgow, for a supply of not less than 100,000 kWh per annum for five years. The estimated cost of the underground cable is £250.

Hull.—HIRE SCHEME FOR WATER HEATERS.—The Electricity Committee has extended the hiring schemes for domestic apparatus to include a complete range of water-heating equipment. In all cases the rentals, which cease after ten years, include wiring, fixing, and plumbing, as well as maintenance.

India.—TRAVANCORE HYDRO-ELECTRIC SCHEME.—The construction of the Pallivasal Hydro-electric Scheme at a cost of about Rs.60 lakhs has now been sanctioned by the Travancore Government. Preliminary work has already been commenced, and a detailed survey of the h.p. transmission lines to Kottayam, Alwaye and Alleppey is in progress. A tunnel 10,000 ft. long will have to be constructed, and it is expected that the scheme will be complete by 1935.

CRITICISM OF PUNJAB SCHEME.—The Punjab Hydro-electric Scheme was severely criticised by the Council when the grants were under discussion. The Council criticised the Government for accepting the responsibility for such a huge project and desired that when the undertaking was finally completed, it should be handed over to a private company. From the Government's side it was pointed out that when the Council attacked the scheme no firm would be prepared to take it over.

Ipswich.—MAINS EXTENSIONS.—The Electricity Committee is to provide an e.h.p. main at Kesgrave at a cost of £1,378.

Kirkcudbright.—LOCAL MEN FOR ELECTRICITY SCHEME.—The County Council has approved the action taken by the Galloway Water Power Co. and by the Ministry of Labour to provide for the employment of local men on the water power scheme.

Lichfield.—ELECTRICITY FOR YOXALL.—The Rural District Council has agreed to the City Council obtaining a Fringe Order to enable a supply of electricity to be given to Yoxall.

Littlehampton.—SUPPLY COMPANY'S NEW PROPOSALS.—New proposals for a reduction in charges, in consideration of the Council's consent to a revocation of its powers of purchase under the Special Order of 1926, have been made to the Council by the Sussex Electricity Supply Co., Ltd. One scheme provides, *inter alia*, for a reduction of the maximum price from 1s. to 9d. per kWh, the introduction of a more favourable two-part domestic tariff, two-part tariffs for public lighting, and commercial purposes, and a special cooking rate of 2d. per kWh. Another proposal offers a reduction in the maximum charge to 10d. per kWh. Both proposals exclude the Council's right to confer with the company at the end of two years and thereafter every five years as to charges. The Council has the matter under consideration.

Llandrindod Wells.—SALE OF UNDERTAKING.—A deputation which waited upon the Electricity Commissioners in connection with the proposed sale of the electricity undertaking to the Shropshire, Worcestershire & Staffordshire Electricity Co. has now reported to the Urban District Council. It is understood that the Council will not agree to a sale at less than £10,000 or £11,000, plus goodwill, and the taking over of the loans.

London.—HAMMERSMITH.—The Electricity Committee recommends the provision of three additional sub-stations and the enlargement of others at a total cost of £7,985.

POPLAR.—The Electricity Committee reports that it is necessary to provide an a.c. supply in duplicate from Farm Gate sub-station to Messrs. Pinchin, Johnson & Co.'s works in Wharf Road at an estimated cost of £2,652. Sanction has been received to the borrowing of £10,818 for mains and other works in connection with supplying the Orchard Place district and for replacing motors consequent upon the change-over from d.c. to a.c.

STEPNEY.—The Electricity Supply Committee is to give supplies of electricity under its assisted wiring scheme to houses in Cleveland Street and Mile End Road.

BATTERSEA.—The Central Public Health Committee and Public Control Committee of the London County Council recommend that no objection be offered to the installation by the London Power Co., Ltd., of an additional 100,000-kW generator set at the Battersea power station. The Electricity Commissioners state that they intend to secure that there will be no additional coal consumption at the Battersea station by providing specifically that the maximum output from the station shall be limited to 720,000,000 kWh a year.

BERMONDSEY.—The Electricity Committee has obtained sanction to the borrowing of £12,000 for mains, £8,000 for meters, and £40,000 for wiring installations.

CHELSEA.—The Borough Council is being asked by its General Purposes Committee to protest against the prices charged for electricity by the Chelsea Electric Supply Co., Ltd.

Manchuria.—ELECTRICAL DEVELOPMENT.—Within the last eighteen months five electricity supply companies, with a capital of $1,500,000, have commenced operations in Manchukuo, three of them being subsidiaries of the South Manchurian Electricity Co. This company has erected 185 miles of transmission line within the last two years, and is now negotiating with the Manchukuo authorities for the supply of electricity to the northern districts.

Margate.—ILLUMINATION SCHEMES.—The Town Council has decided to improve the illuminations of the seafront, the Winter Gardens, and the Oval, by means of strip lighting, at a cost of £355.

Plymouth.—EXTENSIONS.—Numerous cable extensions were approved by the Electricity Committee last week, when it was also decided to make application for sanction to the borrowing of a further £10,000 for the free wiring scheme.

Preston.—MAINS EXTENSIONS.—The Electricity Committee has approved the following extensions to mains: Croston Road, Garstang (£135); Shirley Lane and Liverpool Road, Longton (£577); Sharoe Green Lane (sub-station, £720); Whitestake (£406); Queen's Road, Fulwood (£489); Lytham Road, Freckleton (£320); Whitehorse Barton (£660); Churchtown (£1,415); Tarnacre Lane (Garstang extension, £390); Kirkland Hall (£219).

A TRAVELLING SHOWROOM.—The Electricity Committee has decided to purchase and equip a travelling showroom at a cost of £750, subject to the Lancashire Electric Power Co.'s paying a half of the cost and also paying the running costs of the showroom.

Rawtenstall.—SUB-STATIONS.—The Electricity Committee is to erect a sub-station at Whitewell Bottom, and has adopted a scheme for the reconstruction of certain sub-stations during the next two years.

FRINGE ORDER.—A Fringe Order is being sought to permit the Corporation to supply electricity to the Dunnockshaw district.

South Africa.—CAPETOWN.—For the year ended December 31st, 1931, the electricity undertaking received a total revenue of £592,630, and the expenditure was £491,095.

Southend-on-Sea.—HOUSE SERVICES.—The Town Council is to apply for sanction to a loan of £12,000 for house services.

South Shields.—RELIEF OF RATES.—The Town Council is to take £22,000 out of the reserves of the Electricity Department for the relief of rates.

Stafford.—MINIMUM CHARGES FOR LIGHTING.—The Town Council has decided to introduce a minimum charge of 5s. per quarter for all lighting consumers; hitherto there has been no minimum charge in the case of prepayment consumers, and in the case of quarterly accounts this charge has been 7s. 6d. per quarter.

MAINS EXTENSIONS.—A new main is to be laid in Rowley Avenue from the sub-station in Newport Road to Rowley Hall at a cost of £650.

Stoke-on-Trent.—MAINS EXTENSIONS.—The extension of mains in Longton Road, Bucknall, Stone Road, Hanford, and Cromartie Street, Longton, is to be carried out at an estimated cost of £1,545. Following a letter from the Electrical Contractors' Association suggesting that the laying of short mains extensions should be expedited, the Electricity Committee has agreed to lay short extensions involving an expenditure up to £100 immediately on receipt of the necessary 20 per cent. guarantee.

STREET LIGHTING IMPROVEMENTS.—Improvements in lighting are to be carried out in a number of streets by the Electricity Committee.

Stratford-on-Avon.—ASPLEY HEATH SUPPLIES.—The Rural District Council has arranged with the Birmingham Electric Supply Department to provide electricity to houses at Aspley Heath at a charge of 10s. per house per annum.

Sunderland.—MAINS AND SERVICES.—The Town Council has received sanction to the borrowing of £20,000 for mains and services.

Todmorden.—MAINS AND SERVICES.—The Electricity Committee is to apply for sanction to a loan of £10,000 for mains and services.

Tunstall (near Richmond, Yorks).—ELECTRICITY ASKED FOR.—A parish meeting decided recently to ask the supply authorities to extend mains to the village.

Walderslade (Kent).—ELECTRICITY SOON.—A supply of electricity will shortly be available from the Kent Electric Power Co. at the charges in force at Chatham.

Whitby.—REDUCED CHARGES.—The Urban District Council has reduced the fixed charge under the domestic tariff from 20 to 15 per cent. of the rateable value, with a minimum of £15.

BULK SUPPLY.—The Council has informed the Central Electricity Board that it is prepared to consider the taking of a bulk supply if the Board is prepared to offer the same tariff as that offered to the Bridlington Corporation.

EXTENSIONS.—The electrical engineer has been authorised to extend the mains on the White Point Estate when a sufficient demand for electricity arises.

Wolverhampton.—ELECTRICITY AVAILABLE FOR ALL SOON.—The Town Council has agreed to the laying of 7,933 yd. of l.p. distributing cable, with feeder pillars, etc., at a cost of £5,624. When the l.p. network is completed, a supply will be available to every householder in Wolverhampton.

Traction

Bournemouth.—TROLLEY-BUSES.—The *Electric Railway, Bus and Tram Journal* reports that an experimental trolley-bus service is to be inaugurated at the end of next month.

Bradford.—CHANGES IN ADMINISTRATION.—If the City Council approves a recommendation of the Tramways Committee, the complete control of the permanent way will come under the Tramways Department instead of, as hitherto, under the City Engineers' Department. The Tramways Committee has contended for years that as it was responsible for the financial results of the tramways it ought to have complete supervision, but only the recent death of the city engineer seems to have given ground for the likelihood of a change in policy by which the Tramways Committee claims there will be substantial economies in management costs.

Dewsbury.—THE PASSENGER TRANSPORT BILL.—West Riding County Council, the only remaining opponent, has now withdrawn its opposition to the Dewsbury and Ossett Passenger Transport Bill, which provides for the abandonment of the tramway system operated by the National Electric Construction Co. and the substitution of buses.

France.—RAILWAY ELECTRIFICATION.—The Paris-Orleans Railway is asking for permission to erect a 90-kV transmission line from Soulac (Lot) to Montauban, in order to feed its 75-mile main line from Brive to Montauban, which is to be electrified on the completion, in 1935, of the electrification work now proceeding on the Vierzon-Brive section. When the conversion of both sections is completed, it will be possible for electric trains to run from Paris to the Spanish border.

Irish Free State.—DUBLIN.—There is a possibility that the line between Dublin and Blessington, which was abandoned last year, may be reopened.

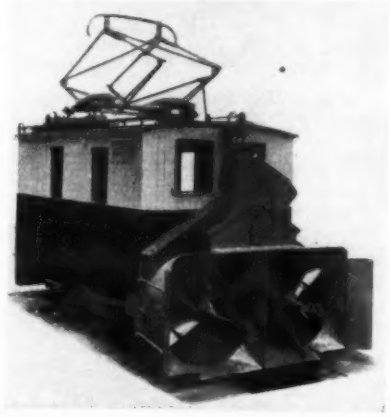
Italy.—NEW ELECTRIC RAILWAY.—A new electric railway has recently been completed and put into operation between Rimini and San Marino (about twenty miles). The line is operated on d.c. at 3,000 V, the power being supplied from an automatic mercury-rectifier station.

L.N.E. Railway.—WIDENING OF LINE.—Provision for a possible conversion to electric traction is made in the plans for the widening of the railway, from two to four tracks, now in progress between Gidea Park and Shenfield. Automatic signalling is being introduced.

Portsmouth.—TROLLEY-BUSES TO REPLACE TRAMS.—The City Council proposes gradually to convert the whole of the tramway system to trolley-bus operation, and as a first step is to proceed with the equipment for trolley-buses of the route from South Parade Pier *via* Waverley Road and Fratton Bridge to Cosham at a cost of £33,700.

South Shields.—LOWER FARES.—The Town Council has introduced lower fares on the trams.

Spain.—A ROTARY SNOW PLOUGH.—A somewhat novel electric rotary snow plough is in service on the 7½-mile metre-gauge mountain railway recently completed between Ribas and Nuria. As there is a difference in altitude of 3,460 ft. between the two places, the line comprises both rail-adhesion and rack sections. Considerable snow falls in the upper sections of the railway, and to keep the line clear the plough illustrated was ordered from the Brown-Boveri Co. The plough is not self-propelling, the overhead gear being used to collect the power necessary for the two electric motors which drive the two rotary ploughs. The vehicle is pushed along at a speed of about 3 m.p.h. by an electric locomotive. A pivot bearing and a circular track with rollers fitted to the middle of the truck enable the body underframe with the snow-plough equipment to be rotated by a crank handle through 180 deg. when the direction of travel is changed. By means of a device operated from inside the vehicle the projected snow may be directed left or right or in both directions at the same time. Since, in snow-plough operation, sudden overloads can occur, the motors used are provided with an auxiliary winding which gives them a preponderant shunt characteristic at small loads and thus prevents their running away. Each motor is designed for an hourly rating of 130 h.p. at 1,800 r.p.m., and they are connected permanently in series. The track can be cleared over a width ranging from 8 ft. 6 in. to 10 ft., at the rate of about 8½ tons per minute. The weight of the plough is nearly 13 tons, of which the electrical equipment weighs 2 tons 8 cwt.



The snow plough used on the Ribas-Nuria mountain railway

Communications

Christmas Islands.—NEW WIRELESS STATIONS.—The small British settlement on Christmas Island, in the Indian Ocean, is 800 miles south of Singapore and 1,000 miles north-west of the Australian continent. The Christmas Island Phosphate Company has for some time past maintained a small wireless station, which is being extended and modernised by the provision of two Marconi stations for direct communication with Singapore and with distant ships. The link with Singapore is by short-wave, utilising a "Type S250" transmitter, covering the waveband of 20 to 100 metres, with a power to the aerial of 250 W when operating continuous wave telegraphy, for which it is particularly designed. For working with ships on medium wavelengths, a special 200-W transmitter has been supplied.

Great Britain.—RADIO RELAY EXCHANGES.—The Petersfield Urban Council is considering an application by Mr. E. Wyatt, of Portsmouth, for permission to establish a relay service on lines similar to that which he has brought into use at Portsmouth.

The Leeds Housing Committee has given permission to Radio By-Wire, Ltd., to make attachments to houses on the Corporation's housing estates, subject to the payment of an annual acknowledgment of 1s. in respect of each attachment.

The Ealing Housing Committee has informed Universal Wireless Relay, Ltd., which proposed to establish relay services in the borough, that the policy of the Council is to disapprove of the establishment of services involving the suspension of wires across public highways.

Droitwich.—NEW B.B.C. TRANSMITTER.—The B.B.C. announces that the purchase of a site has now been completed for the new long-wave high-power transmitting station which is to replace the Daventry (5XX) transmitter. The site is three miles north-east of Droitwich, and the new transmitter, which will radiate the National programme, is designed to work on a power of 100 kW. The station will contain, in addition, a high-power medium-wave Regional transmitter which will replace the existing Midland Regional transmitter (5GB) now situated at Daventry.

London.—B.B.C. REPORT.—The annual general report for 1932 of the British Broadcasting Corporation (H.M. Stationery Office, 4d.) reveals that there were 59.547 hours of broadcasting, with a "breakdown" time of only 17 hours 46 minutes. The number of receiving licences issued grew by 932,218 to a total of 5,262,953. Of the fee of 10s. per licence the B.B.C. received only 4s. 7d. The net revenue increased by £203,388 to £1,628,738. A grant of £150,000 was made to the Exchequer, and £250,000 was transferred to capital account. The expenditure on programmes grew by £5,489 to £663,424.

Palestine. TELEPHONE COMMUNICATION WITH LONDON.—Telephone communication is to be established between Jerusalem and London to-morrow, April 1st.

The Electrical Sterilisation of Water

AT a recent meeting in Paris of the Société Francaise des Electriciens, M. M. P. Otto, President of the Société Havraise d'Energie Electrique, of Le Havre, read a paper on "The Electrical Sterilisation of Water," in the course of which he stated that his system for the use of ozone for this purpose was now being employed not merely in households, but also in large installations capable of sterilising up to 22,000,000 gallons per day. At St. Maur the plant for the treatment of the water of the River Marne, for supply to Paris, which has been in operation for the past ten years, is now being extended to give a sterilised supply of about 66,000,000 gallons per day by means of eight batteries of ozonisers supplied with electricity at 500 cycles per second from a special sub-station. At Nancy work is in hand for a plant for use in connection with a water supply from the River Moselle along a 7½-mile aqueduct to give 22,000,000 gallons of sterilised water per day. At Toulon, where a total of from 2,200 to 3,300 million gallons per annum is taken from the Rivers Indre and Coramy, a dam and a 1,000-kW hydro-electric generating station are being constructed to supply the necessary electric power for the ozonising plant.

Contract Information

When "Contracts Open" are advertised in our "Official Notice" pages the date of the "Electrical Review" containing the advertisement is given in parentheses below

Contracts Open

Australia.—MELBOURNE.—June 7th. City Council. One or two boiler units. City Electrical Engineer's office (deposit £1 1s.).

BRISBANE.—June 22nd. City Electric Light Co., Ltd. 45-kV and 11-kV switchgear. (A.X. 11749.)*

July 20th. Supervisory control equipment for circuit breakers. (A.X. 11750.)*

SYDNEY.—June 14th. N.S.W. Department of Railways. 500-kW turbo-alternator for Zarra Street power station. Chief electrical engineer, 61, Hunter Street, Sydney (specifications 5s. each).

Carlisle. — April 5th. Electricity Department. Cables. (March 17th.)

Cheadle and Gatley.—April 15th. Electricity Department. L.p. switchgear. (See this issue.)

Deptford.—May 3rd. Town Council. Lamps. (See this issue.)

Dover.—April 21st. Corporation. Switchgear, transformers and rotary convertor. (See this issue.)

Dundee.—April 6th. Electricity Department A.c. house service meters. (March 24th.)

April 6th. General engineering stores for twelve months. Mr. D. H. Bishop, general manager and engineer, Electricity Department.

Egypt.—CAIRO.—April 25th. Ministry of the Interior. Motors, control panels, meters, &c. (A.X. 11738.)*

Farnworth.—April 3rd. Electricity Department. Cables and wiring accessories. (March 24th.)

Glasgow.—April 4th. Housing Department. Materials, including electrical fittings and cables. Director of housing, 20, Trongate.

April 1st. Public Health Department. Various articles, including electrical fittings for hospitals, &c. Superintendent of stores, Public Health Department, 23, Montrose Street.

Gloucester.—Electricity Department. 6,000-kVA 33 kV/11-kV transformers. (March 24th.)

India.—April 5th. Bombay, Baroda and Central India Railway. Composition boxes, plates, separators, &c., for train-lighting accumulators; also lamps. (March 24th.)

NEW DELHI.—April 24th. Indian Stores Department. Wall plugs, ceiling roses, &c. (A.X. 11739.)*

London.—FULHAM.—April 12th. Borough Council. Prepayment and quarterly house service meters. (See this issue.)

Morocco.—CASABLANCA.—April 19th. Public Works Department. Electric cable and transformer sub-stations for supplying four coal-handling cranes. (A.X. 11733.)*

New Zealand.—WELLINGTON.—May 23rd. Public Works Department. Three 110-kV oil immersed circuit breakers. (A.X. 11751.)*

South Africa.—CAPETOWN.—April 5th. Electricity Department. Overhead line material. (A.X. 11730.)*

JOHANNESBURG.—April 20th. City Council. Weatherproof braided copper conductors (A.X. 11724)* and a 1,000-kW a.c. to d.c. convertor plant (A.X. 11725)*.

April 15th. 300-A. 6,600-V isolating links. (A. 11737.)*

DURBAN.—April 21st. City Council. Lead-covered paper-insulated telephone cable (A.X. 11726)*, cable distribution boxes and sundries (A.X. 11727)*, and lead-covered indoor telephone cable (A.X. 11728)*.

Southport.—April 11th. Southport and District Water Board. Three electrically driven centrifugal pumping sets. Mr. C. B. Ede, engineer and manager, 14, Portland Street (deposit £3 3s.).

Stoke-on-Trent.—April 5th. Electricity Department. Static transformers and e.h.p. truck-type switchgear. (March 17th.)

Tynemouth.—April 3rd. Electricity Department. Voltage regulator and 200-kW mercury rectifier. (March 10th.)

Tilbury.—April 10th. Urban District Council. Electric lighting and cooking installations in Council houses. (March 24th.)

Warrington.—April 3rd. Electricity Department. Transformers. (March 17th.)

West Riding.—County Council. Persons and firms wishing to have their names placed on the list of those from whom the Supplies Committee may invite quotations for various services and stores are asked to apply to the manager, Supplies Department, Cliff Lane, Wakefield. (March 24th.)

Worthing.—April 6th. Corporation. Electrical stores. Borough engineer and surveyor, Beach House, Brighton Road, Worthing.

* Further particulars can be obtained at the Department of Overseas Trade (Inquiry Room), 35, Old Queen Street, S.W.1.

Contracts Closed

Girvan.—Town Council. Accepted. Installation of electric lighting at the M'Master Hall (£401).—Watson & Dundas.

Grimsby.—Cleansing Committee. Recommended. Electric vehicle battery (£196).—Chloride Electrical Storage Co., Ltd.

Leicester.—Electricity Committee. Accepted. Switchgear equipment at central power station (£11,319).—Ferguson Pailin, Ltd.

London.—Metropolitan Water Board. Accepted. Twelve pressure-operated electric switches for Brixton works (£165).—Igranic Electric Co., Ltd.

STEPNEY.—Electricity Supply Committee. Recommended. Cables for two years to March, 1935.—W. T. Henley's Telegraph Works Co., Ltd.

HAMMERSMITH.—Electricity Committee. Recommended. Switchgear for Starch Green sub-station (£998).—Ferguson, Pailin, Ltd. Nine 200-kVA transformers (£1,620).—British Electric Transformer Co., Ltd.

Stores for twelve months:—Electrical goods.—General Electric Co., Ltd. Cables.—Metropolitan Electric Cable & Construction Co., Ltd. Insulated wire.—Lighting, Heating & Traction Supplies Co. Meters.—Aron Electricity Meter, Ltd.; Metropolitan-Vickers Electrical Co., Ltd.

Ramsgate.—Town Council. Accepted. Reconditioning the controller of the Marina lift, and adapting it as a two-speed controller (£363).—Waygood-Otis, Ltd.

Rugby.—Rural District Council. Accepted. Installation of electric lighting at houses at Brinklow, Marton, Harborough Magna, and Church Lawford.—Rugby Electrical Engineering Co.

Southend-on-Sea.—Town Council. Accepted. Installation of traffic control signals at the junction of Chalkwell Avenue and King's Road (£583).—Automatic Telephone Manufacturing Co., Ltd. Strip lighting on the cliffs (£85).—F. P. Richard & Co.

Stoke-on-Trent.—Electricity Committee. Accepted. Mains and cables for twelve months.—Callender's Cable & Construction Co., Ltd. Overhead transmission lines for twelve months.—Overhead, Ltd.

Stratford-on-Avon.—Rural District Council. Accepted. Wiring houses at Aspley Heath for electric lighting (£3 8s. 6d. per house).—Warwickshire Electrical Service Co.

Forthcoming Events

Institution of Heating and Ventilating Engineers.—Wednesday, April 5th. Home Office Industrial Museum, S.W. 7 p.m. "The Application of Refrigeration to Air Conditioning." Mr. B. C. Oldham.

Rugby Engineering Society.—Wednesday, April 5th. "Light Sensitive Cells." Dr. F. H. Constable.

Electrical Power Engineers' Association.—(*London Technical Group*).—Thursday, April 6th. Junior Institution of Engineers, London, S.W. 7.15 p.m. "Condenser Troubles—Erosion and Corrosion." Mr. H. F. Sherborne.

Institution of Electrical Engineers.—Thursday, April 6th. Institution, London, W.C. 6 p.m. "The Electrification of the Manchester South Junction and Altrincham Railway." Lt.-Col. F. A. Cortez Leigh. (*London Students' Section*).—Saturday, April 1st. 2.30 p.m. Visit to the North Met. Electric Supply Co.'s power station, Brimsdown. (*South Midland Centre*).—Monday, April 3rd. University, Birmingham. 7 p.m. Annual meeting. "The Present Practical Limits of Power Station Efficiency." Mr. W. S. Burge. (*North-Western Centre*).—Tuesday, April 4th. Engineer's Club, Manchester. 7 p.m. Annual meeting. "The Electrification of the Manchester South Junction and Altrincham Railway." Lt.-Col. F. A. Cortez Leigh. (*Wireless Section*).—Wednesday, April 5th. Instn, Ldn, W.C. 6 p.m. "Errors in Direction-Finding Calibrations of Steel Ships due to the Shape and Orientation of the Aerial of the Transmitting Station." Mr. J. F. Coales. "A Radio Compass in H.M. Signal School." Messrs. C. E. Horton and C. Crampton. (*Meter and Instrument Section*).—Friday, April 7th. Instn, Ldn. 7 p.m. "Electrical Methods of Geophysical Prospecting." Mr. J. McG. Bruckshaw. (*North-Eastern Students' Section*).—Friday, April 7th. Armstrong College, Newcastle-on-Tyne. 7.15 p.m. Annual general meeting and short paper night. Saturday, April 8th. 3 p.m. Visit to Dunston power station.

Electrical Association for Women.—Friday, April 7th. Dorchester Hotel, Park Lane, W. 9 p.m. Annual ball.

The I.E.E. Summer Meeting

The annual summer meeting of the Institution of Electrical Engineers will be held at the Western Centre, with headquarters at Bath. The programme is as follows:—

Monday, May 29th.—Evening: reunion at the Guildhall, Bath.

Tuesday, May 30th.—Excursion by special train to Severn Tunnel Junction; thence by motor coaches in two parties *via* (*a*) Chepstow, Monmouth, Usk, and (*b*) Caerwent and old Roman city. Luncheon at Cardiff at the invitation of the South Wales and Monmouthshire Coal Owners' Association. Evening: civic reception and dance, Bath.

Wednesday, May 31st.—Excursion by motor coaches to Gloucester, Cheltenham, and Birdlip, in the Cotswolds; evening free.

Thursday, June 1st.—Inspection of Bristol Corporation's power station at Portishead and grid switching station. Alternative afternoon visits in Bristol to the tobacco factory of Messrs. W. D. & H. O. Wills, the Bristol Aeroplane Co., Ltd., and the motor constructional works of the Bristol Tramways & Carriage Co., Ltd. Evening: civic reception, Bristol.

Friday, June 2nd.—Excursion by motor coaches to Burrington Combe, over the Mendips, and through the Cheddar Gorge to Wookey Hole cave, returning *via* Wells to Bath for dancing in the evening.

Notes

The I.E.E. Students' Dinner

The twenty-sixth annual dinner of the London Students' Section of the Institution of Electrical Engineers was held at the Imperial Hotel, W.C., on March 22nd, when the section chairman, Mr. H. S. Hind, presided over a gathering of ninety. "The Institution of Electrical Engineers" was proposed by Mr. J. H. Marsh (acting hon. secretary), who referred to the intellectual satisfaction to be gained by young engineers through close connection with the Institution in its academic and social aspects. Professor E. W. Marchant (president, I.E.E.), responding, said that the strength of the Students' Section was one of the Institution's biggest assets. Electricity had by no means reached its highest point of development, but it was the use to which it was put that was the important thing. Public respect of a profession would be in accordance with the services rendered by it.

The toast of the guests was put by Mr. R. C. W. Joyce (hon. gen. sec., London Students' Section), who referred particularly to the encouragement and help given to the section by the President, Messrs. F. W. Crawter, H. T. Young, J. H. Reyner, P. F. Rowell, and his staff, T. S. Smith (in organising social functions), and the electrical Press. Response was made by Mr. A. S. West (hon. sec., Association of London Students' I.C.E.), who looked forward to still closer working between the engineering bodies. "The Students' Section" was proposed by Mr. H. T. Young, who said that the section was started in 1887 with only seventy-nine students out of a total membership of 1,342; to-day there were 2,700 students and 2,900 graduates out of a total of over 15,000 members. Mr. J. H. Tree, who was to retire this summer, had fathered the section from the outset. The chairman, responding, urged young engineers to take the opportunity afforded by the section to get an idea of what others were doing. The speeches were interspersed with enjoyable musical items by both amateur and professional talent.

An E.P.E.A. Dinner

The speeches at the annual dinner and reunion of the London Western Section of the Electrical Power Engineers' Association, held on March 25th at St. Ermins, S.W.1, were commendably short, and Mr. Oswald, in thanking Messrs. W. C. Cornet and Hildebrand for organising so pleasant an evening's entertainment (vocal and otherwise best), expressed the general views. The toast of "The Association" was proposed by Mr. F. W. Purse (vice-president, I.E.E.), who considered that the work of the National Joint Board had shown that the Association was of benefit to both sides; he referred especially to the pioneering efforts of the first president, Mr. A. L. Lunn, who was present.

Mr. R. H. Toynbee (senior vice-president) mentioned that a committee of the Association had been most sympathetically received by Sir Andrew Duncan. Mr. A. W. Nunn (vice-chairman) proposed the health of the chairman, Mr. E. W. Greenway, who briefly responded.

Institution of Engineers-in-Charge

There were over 200 present at the annual dinner of the Institution of Engineers-in-Charge which was held at the Holborn Restaurant, W.C., on March 24th. Mr. A. E. L. Chorlton, M.P. (president, I.Mech.E.), proposing the toast of "The Institution," suggested that the engineering societies should join together in an annual convention with a view to obtaining recognition of their views, as mass pressure only was effective in politics. The president, Lt.-Col. J. D. K. Restler, responding, recalled that the Institution was originally formed by marine engineers who had obtained shore-berths in the supervision of plant owned by public bodies and who wished to ensure that such plant should be efficiently operated by qualified men. He also referred to the yeoman service for many years rendered to the Institution by the honorary secretary, Capt. A. E. Penn.

"Our Public Services" was proposed by Sir Edward Holland, Ald. R. W. James (vice-chairman, Metropolitan Water Board) responding, and "Our Guests and Friends" by Mr. E. A. Sandford Fawcett (vice-president,) Sir Alfred Baker replying. The health of the chairman was proposed by Mr. A. T. Penn (vice-president).

Appointments Vacant

Tramway general manager and engineer for St. Helens Corporation.

Junior charge engineer for Barrow-in-Furness Electricity Department.

(See our classified advertisements.)

The Annual Conference of the E.A.W.

The eighth annual conference of the Electrical Association for Women will be held at Birmingham, with headquarters at the Grand Hotel. The programme is:—

Wednesday, May 3rd.—President and Committee of Midlands Branch evening "at home."

Thursday, May 4th.—Civic welcome; papers on "Electricity and the Countrywoman," by Mr. J. T. H. Legge (cinema film), and Miss Henriette W. Nissen (Department of Agriculture, Norway). Afternoon: visit to Ham's Hall power station of Birmingham Corporation, and evening reception by the Birmingham Electric Supply Committee.

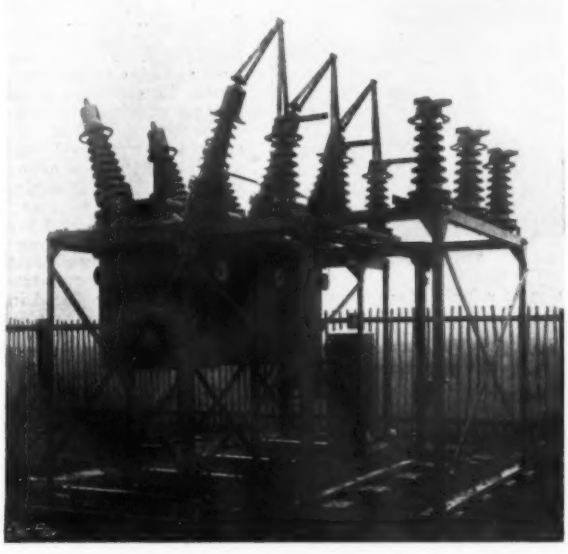
Friday, May 5th.—Annual general meeting and discussion on "The Work of the E.A.W. and Branch Organisation." Luncheon at Witton and afternoon tour of the G.E.C. works; talk on "The Modern Tendency in the Design of Domestic Electrical Appliances." Evening: visit to the Birmingham Repertory Theatre.

The London and Home Counties J.E.A.

The total gross trading surplus of the London and Home Counties Joint Electricity Authority for the year ending to-day is £196,139. After allowing for loan charges at 8¼ per cent., the net surplus is £25,064 (£7,975 for Sutton and District and £17,089 for the Thames Valley and Mid-Surrey undertakings). There remain only appropriations for reserve for income tax, bad debts and general, and for superannuation fund. For next year the estimated surplus is £72,449. For this figure £20,000 has been excluded to cover lag of revenue due to the introduction of continuous meter reading in Sutton. The estimated gross revenue for 1933-34 (£590,210) is based upon an increase of 25 per cent. (excluding certain large power consumers) with an allowance for reductions in tariffs on January 1st, 1933. Provision is made for 15 per cent. increase in capital expenditure. Deducting working expenses in 1933-34 (£325,795) from the gross revenue gives an estimated trading surplus of £264,415; allowing for loan charges at 8¼ per cent., the net surplus becomes £47,385. During the past twelve months the Authority has spent about £200,000 in the development and extension of services. Since January 1st, 1931, reduced prices have saved consumers nearly £250,000, and the amount of energy sold has increased by 75 per cent.

Compressed-air Operated Switchgear

Referring to the description of the new Blackburn Meadows power station, Sheffield, in our last issue, Messrs. A. Reyrolle & Co., Ltd., tell us that they have conducted an experiment



A Reyrolle standard 66,000-V three-phase switch adapted for experimental compressed-air operation

on pneumatic control in connection with a standard outdoor three-phase, 66,000-V, 750,000-kVA circuit-breaker. Simple pneumatic gear replaces the electrical operating mechanism of the switch which was erected in the open. Successful operation was obtained in all weathers at temperatures from 11 deg. F. to 70 deg. F.

The Brighton Explosion

In a report to the Brighton Town Council regarding the explosion in a pulverised-fuel storage bin at Southwick power station on March 11th, referred to in our issue of the following week, Mr. W. N. C. Clinch, borough electrical engineer, says that the accident appears to have been due to the air-coal ratio in the practically empty bin being for a period such as to be of explosive tendency under the atmospheric conditions obtaining at the time. Ignition was caused by the passage into the bin of sufficient particles of coal which may have lodged in a section of the piping and become partially ignited, probably due to spontaneous combustion. In this type of plant, of which there are a number in operation elsewhere, fires in the powdered fuel storage bins are not unusual or serious, and to prevent the sustaining of a pressure increase in the system, relief valves to atmosphere are fitted on the cyclone separator.

Makers' Names Wanted

Splendia electric iron.
Pixie electric dish washing machine.
Dum-Dum glazing compound.
Ido electric clocks.

Our Personal Column

Electrical men are invited to enable us to keep readers of the "Electrical Review" posted concerning their movements

Sir Archibald Page is referred to as general manager (dropping the title of chief engineer) in the report of the Central Electricity Board for 1932. **Mr. Johnstone Wright** (formerly deputy chief engineer) is now chief engineer, and **Mr. Harold Hobson** (formerly supply engineer) is commercial manager.

Sir Courtauld Thomson, K.B.E., and **Wing-Commander Sir Norman Leslie,** Bt., C.M.G., have been elected to the courts of Cables and Wireless, Ltd., and Imperial and International Communications, Ltd., and the boards of their associated companies.

Mr. B. Welbourn has been nominated by the Committee of the Mersey and North Wales (Liverpool) Centre of the Institution of Electrical Engineers as the chairman for the 1933-34 session, and Messrs. R. G. Devey and O. C. Waygood have been nominated as vice-chairmen.

Mr. T. R. Whitehead, general manager and engineer of the Coventry Corporation transport undertaking, who has retired after thirty-seven years' service, has been presented by the Midland Association of Municipal Tramways and Transport with an inscribed silver tea service.

Mr. H. Brierley

Mr. H. Brierley, A.M.I.E.E., who, as recorded in our last issue, has been appointed distribution superintendent in the Croydon Corporation Electricity Department, received his early electrical training with the Corlett Electrical Engineering Co., Wigan. During the war he served in the Navy, and subsequently took a three years' course in electrical engineering at King's College, University of London. He afterwards received an appointment on the mains staff of the Lancashire Electric Power Co., and five years later joined the Yorkshire Electric Power Co., where he was first engaged on the preparation of schemes for mains extensions, and was later placed in charge of the company's western area. He went to Croydon as deputy distribution engineer at the beginning of 1930.

Mr. D. B. Taylor, an assistant mains engineer to the Hammersmith Electricity Department, has resigned his position upon obtaining an appointment under the Hampstead Borough Council.

Mr. R. H. Paterson, electrical engineer to the Hammersmith Borough Council, has resigned owing to ill-health. Mr. Paterson had been in the service of the Council since August, 1902, and became borough electrical engineer in 1929.

Mr. J. H. Tree, so well known to all classes of the membership of the Institution of Electrical Engineers, is retiring from his position with that body in June. Mention was made of the fact at the annual dinner of the London Students' Section last Friday. It was remarked that Mr. Tree had fathered the Section from the outset.

Dr. C. W. C. Kaye and Mr. G. E. Bell, joint authors of the paper on "The Measurement of X-Ray Tube Current and Voltage," read before the I.E.E., in London yesterday evening. **(See page 452)**

Mr. P. J. Robinson, city electrical engineer, is to have the honorary degree of M.Eng. conferred upon him by the Senate and Council of the University of Liverpool. Mr. Robinson joined the Liverpool Corporation in 1902, when the undertaking of the Garston & District Electric Supply Co., Ltd., was taken over. He was appointed to his present position in 1928, on the death of Mr. Harold Dickinson, and was responsible for the design of the Clarence Dock power station.

Mr. Bertram Thomas was elected president of the Engineers Club, Manchester, in succession to **Mr. J. B. L. Meek,** at the annual meeting held on Tuesday last.

Mr. L. H. Finedon has been appointed sales manager of the electrical department of Messrs. Chatterton & Keen, Ltd. Mr. Finedon was formerly with the Consolidated Pneumatic Tool Co., Ltd.

Dr. J. L. Miller and **Mr. J. E. L. Robinson,** of Messrs. Ferranti, Ltd., have been awarded the Institute of Physics prize for their joint contribution to the Laboratory and Workshop Notes in the *Journal of Scientific Instruments* on "A Three-Dimensional Adjustment of an Electrode in Vacuo."

Mr. E. Ewart, of the North Wales Power Co., the winner of the E.D.A. Public Speaking Competition

Mr. W. Blair Smith, M.I.E.E., has set up in business at 170, Hope Street, Glasgow, as agent for several electrical firms for the whole of Scotland. Mr. Smith was formerly electrical engineer and manager of the Paisley electricity undertaking, but, as recorded in our issue of July 8th last, p. 66, relinquished that position owing to ill-health.

Mr. George Paton, A.M.I.E.E., who was connected with electrical undertakings in N. China for ten years before the War, and who was recently with the British Thomson-Houston Co., Ltd., has now joined the staff of Messrs. Brooks & White, electrical engineers, of West Kensington, as sales engineer.

Mr. A. L. Barclay, district manager of the Post Office telephones at Chester, has been appointed manager for the Liverpool district. He commenced with the National Telephone Co. in 1898, and went to Chester five years ago.

Mr. A. N. D. Kerr, who opened the discussion at the Institution of Electrical Engineers on Monday last on "The Performance of Fractional h.p. Motors," is a graduate member of the London Students' Section, and has therefore had an experience rare to members of the Students' Section, in opening one of the informal discussions. He is at present with Messrs. Crompton Parkinson, Ltd. He is a member of the Students' General Committee, and at the invitation of the Institution Council was co-opted a member of the Informal Meetings Committee. In November last Mr. Kerr was elected a councillor of the borough of Barnes, to represent the Essex ward of that town for the ensuing year.

Mr. A. N. D. Kerr

Sir Henry Fowler, K.B.E., was elected president of the Institute of Metals at the recent annual meeting held in London.

Obituary

Mr. C. Faith.—The death has occurred at Seghill (Northumberland) of Mr. Charles Faith, who for the past twenty-two years had been chief electrician at Seghill Colliery. Formerly he was employed by Messrs. Reid, Ferens & Co., Ltd., electrical engineers, Newcastle. He began his career with the Sunderland Forge & Engineering Co.

Mr. H. Morgan.—The death has occurred, at the age of seventy years, of Mr. Henry Morgan, for many years on the electrical staff at the Crewe railway works. He had charge of the electrical reconstruction of the steelworks plant, and also of the electrification of Crewe station and sidings.

Mr. A. L. Spalding.—The death is announced of Mr. A. L. Spalding, of Imperial & International Communications, Ltd., which occurred at Welwyn Garden City on March 24th.

Financial Section

New Companies, Returns of Share Capital, Debenture Charges, Reports of Electrical Companies, Dividend Changes, Transactions in Stocks and Shares

New Companies Registered

British Dry Cell Manufacturing Co., Ltd.—Private company. Registered March 23rd. Capital, £1,000 in £1 shares (900 ordinary and 100 deferred). Objects: To carry on the business of manufacturers of and dealers in dry cells, high-tension batteries, wireless and electrical goods and accessories, &c. The directors are: D. Grabow, 45, Litchfield Way, N.W.11; and E. S. Harley, 115, Shacklewell Lane, E.8. Registered office: 89a, Downs Park Road, Hackney, E.8.

British Valve Co., Ltd.—Private company. Registered March 21st. Capital, £1,000 in 1s. shares (7,500 7½ per cent. cumulative preference). Objects: To carry on the business of general wholesale and retail merchants, importers, exporters and manufacturers of electrical, mechanical and general engineering apparatus and goods of all kinds, &c. The directors are: W. D. Crabbe, "Dunedin," 195, New Park Road, S.W.2, and two others. Secretary: Walter D. Crabbe.

Radiolone, Ltd.—Private company. Registered March 17th. Capital, £1,000 in £1 shares (900 10 per cent. cumulative preference and 100 ordinary). Objects: To carry on the business of electrical engineers, wholesale and retail dealers in and manufacturers of radio, wireless, electrical and mechanical goods and instruments, &c. The subscribers are: F. W. Ellingsworth, 2285, Croxted Road, Dulwich, S.E.; and C. Mulhern, 19, Cherrydown Avenue, South Chingford, E.4. Registered office: 10, Cromwell Place, Kensington, W.1.

Cannon Electrical Appliances, Ltd.—Private company. Registered March 22nd. Capital, £100 in 5s. shares. Objects: To carry on the business of patentees and makers of and dealers in electrical apparatus and appliances, &c. The subscribers are: E. Smith, Broad Oak Cottage, Westfield, Woking; and H. Oldham, 30, Bush Lane, E.C.4. Secretary: H. E. Oldham.

Mavox Radio, Ltd.—Private company. Registered March 24th. Capital, £2,000 in 5s. ordinary shares. Objects: To carry on the business of manufacturers of and dealers in wireless and television apparatus, electrical fittings, appliances and accessories, &c. The directors are: C. Pitt, 7, St. George's Road, St. Margarets, Twickenham; and J. E. Underhay, 9, Cromartie Road, Hornsey Rise, N.19.

S. Landau & Sons (Radio), Ltd.—Private company. Registered March 24th. Capital, £500 in 400 ordinary shares of £1 and 2,000 founders' shares of 1s. each. Objects: To carry on the business of dealers in radio, gramophone, electrical goods, &c. The directors are: S. Landau, Mrs. Sadie Landau, V. Landau, A. Landau, and E. J. Landau, all of 300, Harrow Road, Paddington, W. Registered office: 33, The Broadway, West Ealing.

H. C. Bridgman & Co., Ltd.—Private company. Registered March 25th. Capital £2,000 in £1 shares (1,000 6 per cent. cumulative preference and 1,000 ordinary). Objects: To acquire the business of an electrical, radio, and general engineer hitherto carried on by Howard C. Bridgman at 55, Queen's Road, Clifton, Bristol. The directors are: Howard C. Bridgman, 7, Abbey Road, Westbury-on-Trym, Bristol; and R. A. Bridgman, Braeside, Abbey Road, Westbury-on-Trym, Bristol.

Returns of Electrical Companies

Neonbar Signs, Ltd.—Debenture dated February 23rd, to secure £500, charged on the company's undertaking and property, present and future, including uncalled capital. Holder: R. A. Barton, 1, Albert Road, Wimbledon Park, S.W.

British Ipso Battery Co., Ltd.—Debenture dated March 14th, to secure £3,000, charged on the company's undertaking and property, present and future, including uncalled capital. Holders: Millard Estates, Ltd., 53, New Broad Street, E.C.

Northern Refrigeration & Electrical Co., Ltd.—J. R. Charlesworth, 85, St. Petersgate, Stockport, ceased to act as receiver and manager on March 1st.

Electricity Services, Ltd.—Capital, £5,000 in £1 shares. Return dated December 26th, 1932. 4,025 shares taken up. £3,965 paid. £60 considered as paid. Mortgages and charges, nil.

Galliers (Wholesale), Ltd.—Capital, £1,000 in £1 shares Return dated January 2nd, 1933. 100 shares taken up. £50 paid. £50 calls unpaid. Mortgages and charges, nil.

Claude-General Neon Lights, Ltd.—Issue on March 13th of £2,500 debentures, part of a series already registered.

Vee-Cee Dry Cell Co. (1927), Ltd.—Capital, £7,000 in £1 shares. Return dated November 1st, 1932. 6,750 shares taken up, £6,350 paid, £400 considered as paid. Mortgages and charges, £6,000.

Price's Electrical Supplies, Ltd.—Capital, £3,000 in £1 shares. Return dated December 23rd, 1932. 1,210 shares taken up, £1,210 paid. Mortgages and charges, nil.

Stearn Electric Co., Ltd.—Issue on March 8th of £300 debentures, part of a series already registered. Particulars also filed of debentures not exceeding £10,000 authorised March 9th, 1933, charged on the company's undertaking and property present and future, including uncalled capital, the amount of the present issue being £10,000.

South-East Kent Electric Power Co., Ltd.—The nominal capital has been increased by the addition of £75,000 in £1 ordinary shares beyond the registered capital of £25,000.

West Kent Electric Co.—The nominal capital has been increased by the addition of £280,000 in £1 ordinary shares beyond the registered capital of £20,000.

City Notes

The British Thomson-Houston Co., Ltd., held its annual meeting on March 27th, Mr. W. C. Lusk (chairman), presiding. In presenting the report and accounts (ELEC. REV., March 24th, p.437), the chairman said the orders received and the shipments from their factories during the year were both less than in the preceding year, and the unexecuted orders on hand at the end of the year were less than at the end of 1931. Considerable economies were effected during the year, and further efforts in this direction were being continued without losing sight of the necessity for maintaining the efficiency of their organisation, and for keeping in a position to take advantage of an improvement in trade when it came. The full effect of a falling-off in business in the heavier electrical engineering products was not felt at once by the manufacturer, due to the considerable time which elapsed between the date on which orders for such products were received and the date on which they were completed. In the year under review they felt the effect of the general falling-off in business of this class of the previous year, and the intensification of the world-wide depression in 1932 resulted in a further reduction in business in the heavier products, which also affected their results, but the full effect of which they would feel in 1933. They accordingly expected 1933 to be an even more difficult year than 1932, unless there was a substantial improvement in business generally within the next few months. During the year they brought to completion a number of important contracts. The electrical equipment of the new sub-stations of the Cockfosters extension of the London Electric Railway Co. was completed during the year. The Uhl River hydro-electric scheme, the electrical apparatus for which was made by them, was recently inaugurated. They completed during the year two 75,000-kW turbo-alternators for the Barking power station of the County of London Electric Supply Co., these being the largest machines of their kind yet manufactured in this country. Their contract with the Southern Railway Co. for the traction motors and control gear for the express service of the London, Brighton and Worthing electrification, was completed during the year, and this service was put into regular operation on January 1st last. A noteworthy achievement was the manufacture at their Rugby works for the Tata Iron & Steel Co. of India of the largest steel rolling mill equipment yet built in this country, consisting of a synchronous motor having a maximum rating of 19,000 h.p. and weighing 160 tons, which was completed and tested within seven weeks from the receipt of the contract. The demand for "Mazda" lamps was well maintained during the year. The volume of overseas business continued to be very small, and British electrical manufacturers had therefore not been able to take full advantage of their improved trading position due to this country being off the gold standard. For years there had been a large excess of electrical manufacturing facilities over any requirements of the home and overseas markets, and this had become still greater with the further reduction during the year of the volume of electrical business throughout the world. Such an excess could not be good for the industry, looked at either from a national point of view or from that of shareholders. It would appear that efforts on the part of the manufacturers to improve this position could never be really effective, for the reason that if they should succeed in agreeing to reduce their existing excess manufacturing facilities, and to restrict such facilities in the future, they would almost certainly be faced with the creation of new facilities in quarters which were not under control. Supply undertakings throughout the country were restricted in respect of any increase in their generating plant. Control of excess manufacturing facilities would not be a very long step from this, and he suggested that it was worth considering whether a suitable body could be set up for the purpose of co-operating with the leading companies of the electrical manufacturing industry with the object of dealing with this question.

British Insulated Cables, Ltd., held its annual meeting on March 28th, Sir Alexander Roger (chairman) presiding. In presenting the report and accounts (ELEC. REV., March 24th, page 437), the chairman said that trading conditions had become increasingly difficult. The volume of available business at home and especially abroad continued to shrink, while competition became more and more intense. It was only by means of great economies in the cost of manufacture and the introduction of new lines of business that they had been able to maintain the aggregate profit. Prices of materials continued to drop, and to maintain their turnover, measured in money, it was now necessary to manufacture double the quantity of goods as compared with about three years ago. During the year they had completed the large orders they had in hand for 66,000 V cables for the Central Electricity Board, the London Power Co., and the North Eastern Electric Supply Co., and they had made and laid an important trunk line cable for the Post Office from Leeds to Derby. They had in hand a large order for the grid overhead network in South Scotland for the Central Electricity Board, but electrical contracts of considerable size, at home or abroad, either for them or for other British manufacturers, were conspicuous by their absence. Their business in the smaller cables and appliances was well maintained, and the actual number of orders received continued to increase. Foreign business continued to be generally small in volume, and was much hampered by difficulties of exchange. There had lately been welcome signs of revival, however, in both Australia and South Africa. Their most important manufacturing development of the year had been their entry into the business of copper refining. They decided to build the first large-scale copper refinery in this country, and having contracted for the necessary supply of material within the Empire, they registered a company entitled British Copper Refiners, Ltd. A refinery adjacent to the Prescot factory had been erected, and it commenced production

on January 4th last. Their company absorbed the major portion of the refinery output, but they were already supplying other firms with copper, and expected to do an increasing business in this way. Referring to the question of railway electrification, Sir Alexander said that the cost of construction and the interest rate payable on the necessary expenditure had both fallen considerably. An almost immediate start could be made on the suburban zone in the Northern area of London. The results obtained by the Southern Railway Co. should remove any lingering doubt as to the economic advantages of electrification. It was more than ever difficult to predict the future of business. They could look forward to the company receiving a fair portion of whatever business was going and seizing every opportunity to expand and develop its business in all promising directions.

The Lancashire Electric Light & Power Co., Ltd., held its annual meeting on March 23rd, Mr. A. Shepherd (chairman) presiding. In presenting the report and accounts (ELEC. REV., March 24th, page 437), the chairman said that the Lancashire Electric Power Co., the statutory company, showed an increase in trading profit of nearly £19,000. The improvement in trade which marked the second half of 1931 continued during the earlier months of 1932, but during the summer the output fell away, and from August onwards the monthly sales showed very little advance on those during the corresponding period of 1931. In December there was actually a slight decrease, owing mainly to the bright and mild weather. During August, September and October their output was adversely affected by strikes in the cotton industry. Notwithstanding this, there was an increase during the year of 20,781,000 kWh sold. Nearly the whole of the increase in output had come from the Kearsley station with the result that the over-all efficiency of the company's generating system showed another slight improvement; the coal consumption per kWh delivered to the mains was 1.361 lb., as against 1.381 lb. for 1931. The net capital expenditure during the year amounted to £155,370, of which £152,000 was expended in distribution. New districts had been opened up at the rate of about 1½ miles per week throughout the year. The new districts were largely rural in character, and time would be required before they became fully developed. The electrical energy sold showed a substantial increase, especially in the textile trade, indicating that, in spite of trade difficulties, there continued to be a steady adoption of electrical methods in the mills. Bulk supplies represented fully one-half of the company's output. The total number of consumers supplied by the company directly and indirectly through bulk supplies approximated to 70,000, an increase on the preceding year's figures of about 18.5 per cent. The l.p. side of the business, *i.e.*, supplies to shops and houses, continued to develop. Their new two-part tariff came into operation at the commencement of 1932, and practically the whole of the 20 per cent. increase in output to l.p. consumers had been on this tariff. They had now a deferred payment system of wiring in operation, as well as a hire-purchase system for the supply of cookers, water-heaters, and other appliances, and increasing use was being made of the facilities afforded. While important new consumers, including cotton spinning mills, were connected during 1932, the chief new contract entered into was for the supply of electricity to the Manchester-Bury electric railway. The new supply was inaugurated on March 6th.

The Shropshire, Worcestershire & Staffordshire Electric Power Co. held its annual meeting on March 24th. Sir Holberry Mensforth (chairman), who presided, said that to enable the redemption of Treasury and bank loans to be effected, and to provide additional capital for the company's developments, five per cent. debenture stock, redeemable 1952-82, had been created to the extent of £3,125,000, of which £3,066,278 was issued at December 31st last. In the latter part of 1932 an issue was made of 300,000 six per cent. cumulative preference shares. During the year under review there had been no real lifting of the world depression, but it was satisfactory to note that, although the industrial demand for electricity had been below normal, they had made progress due to the considerable expansion in the domestic demand, not only in those areas already supplied, but in the direction of affording supplies to new areas. In 1932 they laid 11,292 new services; there was an increase of approximately 13 per cent. in the sales of electricity, while the number of consumers supplied by the company and its smaller subsidiaries had increased by approximately 27 per cent. They had acquired the undertaking at Ross-on-Wye, and in addition had been granted the Radnorshire and Brecknockshire Special Order; they were at present engaged in taking their transmission lines into this new area. They had now provided a network of transmission and distribution lines over the major part of the area of supply, which was capable of dealing adequately with any available loads. The grid lines and sub-stations of the Central Electricity Board were nearing completion and recently a large sub-station adjacent to their Stourport station had been subjected to satisfactory trials. The South Wales Power Co., in which they became interested some two years ago, had made satisfactory progress.

The Clyde Valley Electrical Power Co. held its annual meeting on March 22nd, Mr. C. Ker (chairman) presiding. In presenting the report and accounts (ELEC. REV., March 10th, p. 365), the chairman said that the decrease in the revenue from sale of power was £50,000, but this was partly offset by increased receipts of £37,000 from sales of electricity used for lighting and domestic purposes. The figures showed the continued stagnation in the principal industries of their district. Since the beginning of this year there had been slight indications of improvement, but it was too early yet to say what the current year had in store for them. Fuel costs were down considerably and other savings had been made under various heads, largely due to the closing down of the Motherwell power station, which had been converted into a sub-station. New contracts signed during the year represented over 20,000 h.p., as against 14,000 h.p. in the preceding year, and they now had 58,000 consumers, an increase of 8,000. During the year a sum of £56,855 had been applied in writing off generating plant at Yoker power station, and during the current year further heavy writings off would be necessary. From January 1st, 1933, their stations at Clyde's Mill and Yoker had been operated under the control of the Central Electricity Board. A scheme for a superannuation fund had been prepared and was now being put into legal form. To start the scheme the company would contribute probably between £50,000 and £60,000, and thereafter would contribute equally with the staff.

The Bournemouth & Poole Electricity Supply Co., Ltd., reports a profit for 1932 of £160,326, as compared with £166,346 in the preceding year, which with £11,894 brought in makes £172,220. After deducting debenture interest, &c., and transferring £20,000 to change-over suspense account, £43,000 to depreciation, and £5,000 to general reserve, it is proposed to pay a final ordinary dividend of 9 per cent., maintaining the year's distribution at 15 per cent., leaving £6,486 to be carried forward. The sales of electricity increased by 3,625,008 kWh to 25,693,546 kWh, and the number of consumers by 1,523 to 27,735. The Bournemouth, Poole and Christchurch Electricity Act, 1932, received Royal Assent in July last; under this the tenure of the company's undertakings has been extended and other provisions have been made regulating rates for supply to consumers. In pursuance of the Act, progressive reductions have been made in electricity charges, and an assisted wiring scheme has been inaugurated. The results of the two-part tariff and the assisted wiring and hire-purchase schemes have been satisfactory. The Blandford Forum and District Electric Supply Co., Ltd., now takes the whole of its supply in bulk from the company. Meeting: April 4th.

The City of London Electric Lighting Co., Ltd., held its annual meeting on March 22nd. Mr. J. B. Braithwaite (chairman), who presided, in presenting the report and accounts (ELEC. REV., March 17th, p. 401) said that during the year under review the sale of electricity had risen to 108,250,633 kWh, an increase of 10,947,528 kWh. Over 7,000,000 kWh of that increase, however, had occurred in bulk supply. The increase of over 15 per cent. in the quantity taken for heating was encouraging. The maximum demand showed a reduction of 3,432 kW at 51,770 kW; thus there was an improvement in the load factor. Generation and distribution expenses showed an increase of only £1,420, with an increase of 11,000,000 kWh. That really meant a striking economy in working costs. Their appeal against the rating assessment was before the House of Lords and they awaited their decision. If the appeal went against them, it was clear that whatever they would have to pay the rates must be covered by charges made to consumers. In the meantime that was holding up the reductions in price which they had planned.

A. Reyrolle & Co., Ltd., report that after providing for depreciation of buildings and plant, the profit for 1932, including interest received, amounted to £104,285, as compared with £106,547 in the preceding year, which with £73,521 brought in, less £1,000 voted for distribution among local charitable and other funds, makes £176,806. The ordinary dividend is maintained at 12½ per cent. and £96,511 is carried forward. The report states that sales showed an increase over 1931. Orders received during the year, however, were considerably less than in the previous year and there was a reduction in the amount of work in hand at December 31st last, which was reflected in the larger amount of capital in investments, loans and cash. The whole of the operations of Messrs. J. H. Holmes & Co., Ltd., have been taken over by and merged in those of the company. Meeting: Newcastle-upon-Tyne, April 4th.

The South Wales Electric Power Co. reports net receipts for 1932 of £131,767, and after deducting debenture interest, rates, &c., there is a balance of £16,936, which with £5,760 brought in makes £22,697. Of this it is proposed to transfer £20,000 to depreciation and reserve, leaving £2,697 to be carried forward. The capital expended during the year upon plant, mains, &c., amounted to £187,017. Supplies of electricity were made available to fourteen new districts, and the number of consumers increased by about 28 per cent. Three Special Orders were obtained covering Gower rural district, the parish of Llangynwyd Middle, the urban district of Blaenavon, and parts of the rural districts of Abergavenny, Pontypool, and Magor. The death of Mr. F. Massingberd Rogers (deputy chairman) and the appointment of Commander R. B. Bates to the board, are recorded.

The International Telephone & Telegraph Corporation.—The consolidated balance-sheet for 1932 shows gross earnings of $67,382,690, as compared with $87,843,525 in 1931, and a loss of $3,981,171, against a net income of $7,654,001. The major portion of the reduction occurred in the telegraph and cable business and in the manufacturing activities. Manufacturing activities are being consolidated in fewer factories, and certain lines of activity which have become unprofitable are being eliminated or curtailed. The board of directors has approved the revaluation of certain assets of the parent and associated companies based on recognition of the drastic change in world-wide economic conditions which has occurred since 1929.

The South London Electric Supply Corporation, Ltd., reports a balance on revenue account for 1932 of £111,344, as against £104,633 in the preceding year, and with £18,976 brought in, the total available is £130,320. After deducting debenture interest, &c., it is proposed to pay a final dividend on the ordinary shares of 4 per cent., making 7 per cent. for the year (against 8½ per cent. on a smaller capital), leaving £28,675 to be carried forward. The electrical energy sold increased from 33,904,823 to 36,015,528 kWh, and the number of consumers by 2,487 to 16,304. Meeting: April 4th.

The Ever Ready Trust, Ltd., has considered the question of the investment of the monies received from the sale of the 8 per cent. cumulative preference shares in Lissen, Ltd., and has decided that the present uncertain financial conditions throughout the world do not justify the investment of so large a sum on trust company lines. It is therefore proposed to return £300,000 to shareholders. This represents 10s. per £1 share on the 500,000 ordinary shares and £50 per £100 share on the deferred shares. Meetings at which resolutions will be submitted will be called in due course.

The Midland Electric Corporation for Power Distribution, Ltd., held its annual meeting on March 28th, Mr. G. H. Nisbett (chairman) presiding. In presenting the report and accounts (Elec. Rev., March 24th, page 437), the chairman said the year's capital expenditure of £71,968 was almost exclusively for feeder and distribution mains, and the necessary plant and apparatus to connect new consumers. During the year they purchased half a million kWh more than in the previous year, new domestic consumers and the extended use of electricity by older consumers more than making up the reduction in the power demand. The cost of electricity was approximately £5,000 less than in 1931, due to a further reduction in the price charged by the West Midlands Joint Electricity Authority. Preparation for the change over from d.c. to a.c. in Wednesbury had continued. The rebate of 10 per cent. on the charges for 1932, which amounted to £40,374, had already been referred to in the report. New charges carrying an average reduction of 10 per cent. were agreed subject to an extension of the company's tenure being acceptable to all parties. A few of the consents were difficult to obtain, and in order that consumers should not suffer from the delay, allowances were made which, on the average, were equivalent to applying the new tariff during 1932. A draft Special Order was deposited with the Electricity Commissioners in January, 1932, and every interest had now expressed consent to this Order, which provided for an extension of the company's tenure until 1973. A formula was incorporated for fixing the commencing capital and the free reserves of the company as at December 31st last. An analysis of the balance sheet showed the total assets to be £1,140,613, of which £932,947 was used in the electricity undertaking and would rank as commencing capital. Of the balance, £200,000 represented the amount of undistributed profits free for investment in the undertaking, this being the maximum allowed. The remaining £7,666 had been earmarked as the nucleus of a fund for pensions or other grants for employés. A standard profit of 6½ per cent. was permitted on the commencing capital, with an additional ½ per cent. for the first ten years. Consumers obtained reductions in prices immediately. A standard tariff was included in the Order, which conceded an average reduction of slightly over 10 per cent. on present prices. Parliamentary sanction to the Order should be obtained within the next few months.

Felten & Guilleaume.—The annual report will show that, although in the second half of 1932 business materially improved, last year's trading did not result in a profit, so that no dividend is to be expected. The balance-sheet will show a very liquid position, since the company has intentionally held aloof from transactions requiring a lengthy period for financing. At the present time 2,300 workers are fully employed. The Berlin correspondent of the *Financial Times* reports that so far in the current year business has been distinctly better. The most important project now in hand is the joint exploitation with the inventor and the Enfield Cable Works, of London, of a patent for making transmission cables for 100,000 V and more. It is stated that the preliminary experiments in England have turned out thoroughly satisfactory.

The Notting Hill Electric Lighting Co., Ltd., reports a profit, including £24,137 brought in, of £80,646 for 1932, as against £99,837 in the preceding year, and after deducting debenture and sinking fund interest, &c., it is proposed to pay a final ordinary dividend of 4.0646 per cent., making 8.0646 per cent. for the year, leaving £21,298 to be carried forward. The special reserve fund of £133,897 has been capitalised by distributing shares to the holders of deferred shares. The deferred shares have been converted into ordinary shares of £1 each. The amount of "consumers' benefit," any additional dividend, and the exact amount of co-partnership bonus cannot be ascertained until the new standard prices to operate from January 1st, 1932, have been approved. Electricity purchased in bulk amounted to 15,057,244 kWh. and the sales increased from 10,985,936 to 12,337,395 kWh. Meeting: April 7th.

The Richmond (Surrey) Electric Light & Power Co., Ltd., reports a profit for 1932 of £33,492, as compared with £48,972 in 1931, which, with £2,878 brought in, makes £36,369. After providing for sinking fund instalment (£1,456), placing £1,500 to change-over expenditure suspense account, and £10,000 to reserve for depreciation, renewals, &c., there is a balance of £23,413. It is proposed to pay a final ordinary dividend of 7 per cent., making 11 per cent. for the year, leaving £1,413 to be carried forward. The sales of electricity increased from 4,642,441 to 5,300,288 kWh.

The Chelsea Electricity Supply Co., Ltd., reports a profit of £55,929 for 1932, as compared with £58,521 in the preceding year, to which is added £6,407 brought in and interest from investments (£1,317), making £63,653. After providing for debenture interest, &c., it is proposed to pay a final dividend on the ordinary shares of 4 per cent., making 7 per cent. for the year, leaving £5,812 to be carried forward. The total connections increased by 1,105 kW to 18,076 kW, and the electrical energy sold by 1,188,662 kWh to 13,893,121 kWh. Meeting: April 6th.

Associated Electrical Industries, Ltd., has recommended a dividend at the rate of 4 per cent. on the ordinary shares for 1932. The dividend for 1931 was at the same rate, but the distribution now proposed is on a larger capital, an issue of £1,399,560 ordinary shares having been made at the end of 1931 to finance the repayment of the 7 per cent. debenture stock of the British Thomson-Houston Co., Ltd. The amount carried forward is £102,414, against £99,899 brought in.

The South Metropolitan Electric Light & Power Co., Ltd., reports a net profit of £232,332 for 1932, against £226,569 for 1931. After deducting debenture interest, writing off new issue expenses, transferring £57,667 to depreciation, £3,807 to contingency fund, and £25,000 to taxation reserve, it is proposed to pay a final ordinary dividend of 6 per cent., making 9 per cent. for the year (same), leaving £52,648 to be carried forward. Meeting: April 4th.

Ericsson Telephones, Ltd., reports a net profit for 1932 of £47,525, as compared with £44,442 in 1931. The amount brought in is £24,576, making £72,101, and it is proposed to maintain the ordinary dividend at 12 per cent., leaving £31,100 to be carried forward. The item "shares in a subsidiary" is given in the balance-sheet at cost (less dividend received), £52,018. This value is dependent upon the legalising of totalisators on greyhound racecourses.

The Canadian General Electric Co. reports a net profit for 1932 of $1,165,660, as compared with $2,308,153 in the preceding year. Working capital at $15,619,399 shows an advance of $438,190, while capital expenditure during the year totalled $228,230, against $1,389,637 in 1931. Dividends of 7 and 8 per cent. has been paid upon the preferred and common shares respectively (as for 1931).

The Brompton & Kensington Electricity Supply Co., Ltd., reports a net profit for 1932 of £33,449, as compared with £42,920 in 1931. A final ordinary dividend of 3½ per cent. is paid, making the standard dividend of 7 per cent. for the year, leaving a balance to be carried forward of £4,114. The connections at December 31st last totalled 38,646 kW, against 35,949 kW, and the sales of electricity increased from 13,477,868 to 15,708,508 kWh. Meeting: April 6th.

The Salisbury Electric Light & Supply Co., Ltd., reports a balance for 1932, after paying debenture interest, providing for income tax and depreciation, and including an amount brought in of £14,328. A final dividend of 6 per cent. is paid, making 10 per cent. for the year, £1,500 is placed to reserve, and £328 is carried forward.

The Mid-Cheshire Electricity Supply Co. reports a net profit for 1932 of £15,915, as compared with £15,586 in 1931. The ordinary dividend is 8 per cent. (against 7½ per cent.), and £3,381 is carried forward (against £3,499 brought in).

Stocks and Shares

Tuesday Evening.

THE latest development of British Government borrowing in the shape of a new 2½ per cent. Conversion issue has proved successful, and the effect has been to maintain the prices of investment stocks and shares as a whole. Money gives no indication of becoming any dearer. If anything, the signs point in the opposite direction: to that, namely, of the cheapness of money becoming still more emphasised.

The investor is faced with the growing tendency of companies to reduce their annual liability through the process of lowering the rate of interest paid on their prior charges. This means, of course, diminution of income, and it happens at a time when people are beginning to realise that, on June 1st next, the previously paid 5 per cent. interest on War Stock is coming down to 3½ per cent. From the point of view of Stock Exchange prices, the corresponding appreciation in values is satisfactory enough, and the present state of affairs enables borrowers to obtain money at easy rates of interest. Such is the demand for investments nowadays that stocks which a year ago might have been regarded as falling into a second rank are now gladly taken at prices which offer but a modest yield on the money. Quotations for electricity issues are mainly higher, owing to the factors already mentioned, and to the knowledge that the industry is one of the few that makes material headway month by month.

Home Electricity Supply

County of London Electric ordinary shares are better at 53s. 9d., upon removal of the vague apprehension that the recent financial crisis in the States might dislodge a certain number of shares supposed to be controlled by American influences. This fear has proved to be baseless, and the price of the shares, as already mentioned, is going ahead. The South London Electric Corporation reports a disposable balance of £130,000, against £140,000 a year ago. The dividend is now 7 per cent., the standard rate. The Richmond (Surrey) Electric Light & Power Company is again paying 11 per cent. for last year. The revenue for 1932 was £33,500, a reduction of £15,000 as compared with the previous twelve months. The investment and general reserves were strengthened in 1931 by £12,500, but in respect of 1932 nothing is proposed for these funds. Bournemouth & Poole increased its number of consumers last year, but the revenue balance fell back by £6,500, a negligible amount that is due largely to reduction in interest and dividend income. These three companies are largely controlled by the County of London Electric Supply Company. Electric Supply Corporation are a feature of strength at 3¼. North Eastern Electric ordinary at 30s. are again 6d. higher.

Scarcity of Shares

Midland Electric Corporation for Power Distribution remained at 38s. 9d., the chairman pointing out at the meeting that although the profits for last year were on a lower scale, maintenance of the 8 per cent. dividend is justified by an adjustment in the manner in which reserves have been treated, an adjustment which in no way impairs the financial position. Scottish Power improved to 36s. 3d. Lancashire Electric are unchanged at 32s. 6d. At the meeting the other day the chairman referred to the success of the new two-part tariff for shops and houses, which the company had put into operation at the beginning of 1932. Other prices in this section are well maintained, and there is a noticeable scarcity of supply, even of the ordinary shares, notwithstanding the prices to which these have now attained, and the fact that at current quotations the yield on the money, taking 7 per cent. as the standard dividend, is under 4¼ per cent. in the cases of such ordinary shares as those of Brompton, Charing Cross, Chelsea, Kensington, Metropolitan and South London.

Hendon ordinary are better at 47s. 8d. Chiswicks hardened to 48s., Llanelly ordinary to 22s. 6d. West Gloucestershire is 2 up at 5¼.

Home Railway Stocks

The outstanding feature in the Home Railway Market is the continued strength of Metropolitan consolidated. Last week the price stood at 71, from which it reacted to 70, only to spurt to 71½ upon the coming into circulation of a brochure setting out in easily understood figures the position of the stocks of the various companies that will be affected by the London Passenger Transport Bill. This brought in buying also of London United Tramways 4 per cent. debenture stock. The nominal price is unchanged at 73½, but a fair amount of stock which was recently overhanging the market has now been taken. The preference shares of the London and Suburban Traction have moved up to 15s. Of the other railway issues, Districts are 1½ higher at 61½, and Underground Electric ordinary shares at 19s. 6d. have gained 6d. on top of their last week's rise of a florin.

British Electric Traction stock has put on 20 points, with a rise to 255.

Manufacturing and Equipment

Brush ordinary stock has lost 5 points at 45. This is the principal movement in the stocks and shares of the companies connected with the manufacturing and equipment side of the electrical industry. Henley's hardened to 6¼. General Electric debenture stock has risen to 105 xd, British Electric Transformer preference to 20s. Aron Electricity income debenture at 102½ is 5 points up. British Aluminium ordinary at 25s. are 6d. harder on the issue of the report which shows a negligible reduction in the company's profits for 1932. The trading profit advanced by £25,000, but the net profit is £4,500 lower, and the dividend on the ordinary shares, as already announced, is unchanged at 5 per cent. A. Reyrolle continues the usual 12½ per cent. dividend on its ordinary shares for the year, and the price of the shares is quoted about 48s. Enfields are a little easier at 4 5/16, Johnson & Phillips receded to 19s. 3d. Crompton Parkinson 6 per cent. preference are a little better at 24s. 6d. Lissen 8 per cent. preference, after being 21s. 6d., picked up to 22s. for the shares now fully paid, that is, 23s. The Ever-Ready Trust directors announce that they propose to return capital to the extent of £300,000, payable as to 10s. on each of the £1 ordinary shares, and £50 on each of the deferred shares. The issued capital will then be £300,000. The reason for the return of capital is the directors' decision that the present uncertain financial conditions throughout the world do not justify the investment of so large a sum on trust company lines. They add that the future income on a percentage basis to the reduced capital of the company should show improvement over previous years. The price of Ever-Ready shares is a trifle better at 27s.

Stock on Offer

Next month there should be published the annual report of the Telephone Properties, Limited, and it may be of interest to mention that £5,000 of the company's 6 per cent. mortgage debenture stock is on offer at 103, giving a yield of £5 16s. 6d. per cent., without making allowance for the accrued interest due on July 1st next. The stock is a first specific charge on the company's holding of £315 208 8 per cent. first mortgage bonds of the Venezuela Telephone Company, and has a floating charge on the English company's undertaking and assets. The issued portion of the stock is covered seven times over by the assets, and the report due next month is expected to show that the interest on the issued debenture stock was covered some five times by last year's earnings.

Dollar Stocks

Second thoughts on President Roosevelt's election have done little to help prices in the market for American stocks and shares. There is, one might add, an obvious feeling of disappointment on both sides of the Atlantic that the new President should have done nothing, up to the present, dramatic or spectacular, in the shape of legislation for helping the United States out of its many financial difficulties. American Telephone & Telegraph stock is down 17½ points at 132½. Consolidated Gas of Baltimore, at 70, has shed 10 points. Pennsylvania remains unchanged at 82½. Of the Canadian stocks, Shawinigan Water & Power is 1½ lower at 13. Power Corporation of Canada at 7½ show a fall of 1½. International Telephones at 9½ are ¾ down, the report recently issued showing deplorable figures. The Mexican stocks show very little alteration. Brazilian Tractions at 9½ are ½ lower.

Cables and Wireless

Upon a recrudescence of the rumours that Cables & Wireless may pay a full half-year's dividend for the period ended with March, the stocks came into active demand, the preference rising 2½ points to 85, the two ordinary stocks both being better. Globe Telegraph & Trust ordinary, however, which usually move in sympathy with Cables & Wireless, fell 5s. to 11¾. International Automatic Telephones, which had a sharp fall last week on there being no bonus in addition to the dividend, have rallied a little to 35s. Great Northern Telegraph fell 10s. to 27, and in the Anglo-American group the deferred stock at 24 is a point lower. Marconi Marines are unchanged at 28s. 9d.

The iron and steel market is quiet. Babcock & Wilcox, at 37s., are 6d. easier on account of dividend apprehensions. Nothing is stirring in the rubber share market.

Share List of Electrical Companies

Home Electricity Companies.

	Nom.	Approx. Dividend. 1930.	1931.	Price, Mar. 28.	Rise or Fall.	Yield, p.c. £ s. d.
Bournemouth and Poole	1	15	15	72/6	—	4 2 8
Brompton Ordinary	1	8½	8½	33/6	—	4 3 7
Central Electricity 4½% Deb.	Stock	4½	4½	108	—	4 3 4
Charing Cross Ordinary	1	8½	8½	33/6	—	4 3 7
Chelsea	1	8½	8½	33/–	—	4 4 10
City of London	1	10	10	34/6	—	4 1 2
Clyde Valley	1	8	7	35/–	—	4 0 0
County of London	1	11	10½	53/9	+ 1/8	3 18 8
Edmundsons' 7% Pref.	1	7	7	30/6	—	4 11 10
Elec. Dis. Yorkshire	1	9	9	45/–	+ 3/8	4 0 0
Elec. Supply Corporation	1	11	11	65/–	+½	3 7 8
Kensington Ordinary	1	8	8	33/–	—	4 4 10
Lancs. Light and Power	1	6½	7	32/6	—	4 6 2
London & Home Counties 4½% Deb.	Stock	4½	4½	108	—	4 3 4
London Electric	1	9	9	32/–	—	4 7 6
Metropolitan	1	10	10	48/9	–	4 2 0
Midland Counties	1	7	7	35/–	+6d.	4 0 0
Mid. Elec. Power	1	8	8	38/9	—	4 2 6
North Eastern Electric Ordinary	1	6	6	30/–	+6d.	4 0 0
Do. 7% Pref.	1	7	7	33/–	—	4 7 6
Northampton	1	10	10	50/–	—	4 0 0
Notting Hill 6% Pref.	10	6	6	13½	—	4 10 7
North Met. Elec. 6% Pref.	1	6	6	30/–	—	4 0 0
St. James' and Pall Mall	1	8	8	32/6	—	4 6 2
Scottish Power	1	8	8	36/3	+ 1/8	4 8 2
South London	1	8½	8½	33/–	—	4 4 10
Urban Ordinary	1	7	7	38/9	+ 1/8	3 12 2
Westminster Ordinary	1	8½	8½	32/6	—	4 6 2
Whitehall Elec. Invst. 7½% Pref.	1	7½	7½	17/6	—	8 11 2
Yorkshire Elec.	1	8	8	41/3	—	3 17 8

Home Rails.

		1931	1932			
Central London Ord. Assented	Stock	4	4	84½	—	4 14 7
Metropolitan	„	2½	1½	71½	+½	2 4 0
Do. District	„	4½	3	61½	+1½	4 17 7
Underground Electric	1	7	4½	19/6	+6d.	4 12 4

Telegraph and Telephones.

		1930	1931			
American Tel. & Tel.	$100	9	9	132½	– 17½	6 15 10
Anglo-Am. Tel. Pref.	Stock	6	6	101½	—	5 18 5
Do. Def.	„	1½	1½	24	—1	6 5 0
Cables & Wireless 5½% Pref.	„	5½	2½	84½	+2	3 5 1
Do. A 7½% Ord.	„	—	Nil	28	+1	—
Do. B Ord.	„	—	Nil	11	+½	—
Globe Tel. and T. Ord.	10	8½	Nil	11½	—½	—
Do. do. Pref.	10	6	6	11¾	—	5 1 2
Great Northern Tel.	10	20	20	27	—½	7 8 2
Marconi-Marine	1	15	10	28/9	—	5 4 4
Oriental Telephone Ord.	1	12	12	3	—	*4 0 0

Home and Foreign Trams, Etc.

Anglo-Arg. Trams First Pref.	5	—	—	1/9	—	—
Do. do. 2nd Pref.	5	—	—	1/9	—	—
Do. do. 5% Deb.	Stock	—	—	6	—	—
British Electric Traction Def. Ord.	„	5	5	255	+20	—
Do. do. Pref. Ord.	„	8	8	135	—	5 18 8
Brazil Traction	100	—	—	9½	—½	—
Brit. Columbia Elec. Rly. Pfd.	Stock	5	5	102½	—	4 19 6
London & Sub. Trac. 5% Pref.	1	Nil	Nil	15/–	+6d.	—
London United Tram Deb.	Stock	4	4	73½	—	5 8 10
Mexico Trams, 5% Bonds	—	5	5	41½	—	12 1 0
Mexican Light Common	100	Nil	Nil	7½	—	—
Do. 7% Pref.	100	7	7	15	—	—
Do. 1st Bonds	—	5	5	74½	—	6 14 3
Victoria Falls Ord.	1	15	15	4½	+½	3 12 10
Yorkshire (West Riding)	1	Nil	Nil	6/–	+6d.	—

Manufacturing Companies.

Assoc. Elec. Ord.	1	6	4	17/6	—	4 11 5
Do. Pref.	1	8	8	30/–	—	5 6 8
Babcock & Wilcox	1	14	14	37/–	–6d.	—
British Aluminium Ord.	1	10	5	25/–	+6d.	4 0 0
British Insulated Ord.	1	15	15	70/–	+½	4 5 9
Brush Ord.	Stock	5	Nil	45	—	—
Callender's	1	15	15	2½	—	5 2 0
Do. 6½% Pref.	1	6½	6½	28/9	—	4 10 5
Crompton Parkinson Ord.	5/–	30	24	21/6	—	5 2 4
Do. 8% Pref.	1	8	8	32/6	—	4 18 6
Edison-Swan 1st Pref.	1	7½	7½	24/6	—	6 2 5
Do. 5% Deb.	Stock	5	5	102½	—	4 17 7
Electric Construction	1	Nil	Nil	12/–	—	—
Enfield Cable Ord.	1	25	25	4 5/8	— 1/8	5 16 1
English Electric	1	Nil	Nil	10/–	–9d.	—
Do. do. Pref.	1	Nil	Nil	14/6	–6d.	—
Ever Ready	5/–	35	35	27/–	+3d.	6 9 6
Ferranti Pref.	1	7	7	24/–	—	5 18 0
G.E.C. Pref.	1	6½	6½	29/9	—	4 7 5
Do. Otd.	1	10	8	41/3	—	3 17 5
Henley's	1	30	30	6½	+ 1/8	4 16 0
Do. 4½% Pref.	5	4½	4½	5½	—	4 5 9
India-Rubber	1	Nil	Nil	2/6	—	—
Johnson & Phillips	1	10	5	19/6	—6d.	5 2 7
Siemens Ord.	1	7½	7½	26/3	—	5 14 3
Telegraph Construction	£1	Nil	Nil	18/9	—	—

* Dividends paid free of Income Tax.

Published Specifications

Compiled expressly for this journal by a firm of chartered patent agents. The numbers in parentheses are those under which the specifications will be printed and abridged, and subsequent proceedings will be taken.

1931

15234. "Circuit arrangements for gas-filled thermionic valves." Dubilier Condenser Co. (1925), Ltd. May 22nd, 1930. (388730.)

15762. "Radio-frequency receivers." Dubilier Condenser Co. (1925), Ltd. May 31st, 1930. (388732.)

15769. "Electrically operated musical instruments." S. Prisner. May 29th, 1931. (Cognate application 27366/31.) (388733.)

21688. "Application of coverings to wires applicable to the insulation of electric conductors and to other purposes." British Insulated Cables, Ltd., and G. H. Nisbett. July 29th, 1931. (Cognate applications, 30046/31, 31135/31, and 1040/32.) (388738.)

21801. "Synchronous electric motors." Ferranti, Ltd., and W. Holmes. July 30th, 1931. (388739.)

23255. "Means for producing alternating current of low frequency from alternating current of high frequency." International General Electric Co., Inc. August 21st, 1930. (Addition to 386976.) (388771.)

24101. "Mercury vapour valves." Akt.-Ges., Brown Boveri, et Cie. September 12th, 1930. (388801.)

24180. "Transformer." K. A. Larsen and W. C. C. J. Caspersen. August 28th, 1931. (388803.)

24240. "Telephone instruments." Associated Telephone & Telegraph Co. May 11th, 1931. (388747.)

24248. "Quick-action electric switches." C. H. Vidal and J. Lucas, Ltd. August 28th, 1931. (388749.)

24256. "Electric current transforming and rectifying devices and the utilisation thereof." Siemens Bros. & Co., Ltd., and H. S. Double. August 28th, 1931. (Cognate application 4850/32.) (388772.)

24257. "Selecting-switches of the kind used in automatic telephone systems." Siemens Bros. & Co., Ltd., and D. Leslie. August 28th, 1931. (Cognate application 24258/31.) (388750.)

24277. "Electrical regulators." British Thomson-Houston Co., Ltd. August 28th, 1930. (388805.)

24311. "Telephone systems." Associated Telephone & Telegraph Co. May 11th, 1931. (388752.)

24347. "Lighting systems for vehicles." F. Duprez. August 29th, 1931. (388807.)

24359. "Short-wave radio and other high-frequency receivers." Marconi's Wireless Telegraph Co., Ltd., and E. W. B. Gill. August 29th, 1931. (388755.)

24360. "Modulation systems suitable for use in wireless signalling and like transmission systems." Marconi's Wireless Telegraph Co., Ltd., and H. J. Round. August 29th, 1931. (388756.)

24372. "Sound collecting and sound radiating devices." Siemens Bros. & Co., Ltd., and G. W. Sutton. August 29th, 1931. (Cognate application 24373/31.) (388757.)

24449. "Electric switchboard indicators." British Thomson-Houston Co., Ltd., and W. R. Goff. August 31st, 1931. (388758.)

24547. "Electric transmission of pictures and the like." Fein-maschinenbau-Ges. September 1st, 1930. (388763.)

24552. "Use of electric motors as generators during braking for use in connection with Diesel-electric locomotives and the like." Sir W. G. Armstrong, Whitworth & Co. (Engineers), Ltd., and C. M. Beckett. September 1st, 1931. (388764.)

24568. "Thermionic valve amplifiers." Associated Telephone & Telegraph Co. September 5th, 1930. (388766.)

24682. "Excess voltage protection devices for mercury-vapour and similar discharge apparatus." Akt.-Ges., Brown Boveri, et Cie. December 1st, 1930. (388808.)

24684. "Electric control systems employing electric discharge devices." British Thomson-Houston Co., Ltd. September 2nd, 1930. (388809.)

24688. "Protection of electric transformers." British Thomson-Houston Co., Ltd., J. G. Wellings, C. G. Mayo, and P. Mathews. September 2nd, 1931. (388810.)

24737. "Keyboard controlled apparatus for telegraph systems." Creed & Co., Ltd., and R. G. Griffith. September 3rd, 1931. (388785.)

24867. "Automatic switches for use in telephone or like systems." Associated Telephone & Telegraph Co. September 8th, 1930. (388815.)

24902. "Radio direction finders and directional radio receivers." Marconi's Wireless Telegraph Co., Ltd., and F. Woods. September 4th, 1931. (388816.)

24918. "Process and apparatus for the electromagnetic recording and reproduction of sounds by means of magnetisable wires, bands, and the like." G. Liguori. September 4th, 1931. (388821.)

24968. "Track circuit signalling systems for railways and the like." Westinghouse Brake & Saxby Signal Co., Ltd. July 13th, 1931. (388823.)

25000. "Electromagnetic relays." Automatic Electric Co., Ltd. H. S. Woodhead, J. St. C. W. Graham, & S. R. Smith. September 5th, 1931. (Addition to 7409/31.) (388824.)

26577. "Electric discharge tubes." British Thomson-Houston Co., Ltd. September 23rd, 1930. (388836.)

27773. "Portable galvanic batteries." A. E. Frost and H. H. Lovell. October 6th, 1931. (388844.)

30135. "Multi-way electric switches." Standard Radio Relay Services, Ltd., and G. M. O. Jenkins. October 30th, 1931. (388857.)

31340. "Electric radiator fires and the like." P. Purser Fletcher, and Hendon Lamp & Accessories Co., Ltd. November 17th, 1931. (388867.)

32040. "Electrical signalling circuits." F. Reid. November 18th, 1931. (388869.)

32916. "Printing telegraph receiving apparatus having case grouping of characters." Creed & Co., Ltd., and R. G. Griffith. November 27th, 1931. (388875.)

33032. "Machines for making electric lamp bulbs and the like." British Thomson-Houston Co., Ltd. November 28th, 1930. (388878.)

33167. "Enclosed electrical apparatus." British Thomson-Houston Co., Ltd. November 29th, 1930. (388879.)

34752. "Electric motors." International General Electric Co., Inc. December 15th, 1930. (388887.)

36075. "Electrical connectors." A. Henderson and H. P. H. Anderson. March 4th, 1932. (388894.)

1932

463. "Apparatus for measuring the properties of liquids the electrical conductivity of which varies with said properties." W. Crockatt & Sons, Ltd., and W. C. Crockatt. January 7th, 1932. (388897.)

972. "Electrical apparatus for transmitting and receiving audio-frequency currents over alternating current power mains." E. Hollowell and Northern Utilities Trust, Ltd. January 13th, 1932. (388901.)

1476. "Apparatus for controlling electric current supply." General Electric Co., Ltd., and D. C. Espley. January 18th, 1932. (388904.)

2178. "Electric immersion heaters as used in kettles and the like." Q. F. Green. January 25th, 1932. (388911.)

4885. "Means for making subdivided connections to an electric conductor." W. T. Henley's Telegraph Works Co., Ltd., and A. T. Crowe. February 18th, 1932. (388925.)

5551. "Apparatus for automatically welding articles by the electric resistance process." Allgemeine Elektricitats-Ges. March 12th, 1931. (388928.)

5792. "High-tension electrical insulators." J. S. Highfield. February 26th, 1932. (388930.)

6413. "Automatic telephone systems." General Electric Co., Ltd., R. M. Hamilton, and B. F. Moss. March 3rd, 1932. (Cognate application 9127/32.) (388935.)

8086. "Dial arrangements, more particularly for wireless apparatus." Ideal Werke Akt.-Ges. für Drahtlose Telephonie. December 18th, 1931. (388938.)

8851. "Galvanic batteries." Oldham & Son, Ltd., and W. D. Wilde. March 24th, 1932. (388941.)

10132. "Apparatus for reproducing sound from a sound film record." British Thomson-Houston Co., Ltd. April 13th, 1931. (388946.)

10866. "Insulating tubes." International General Electric Co., Inc. April 15th, 1931. (388949.)

11154. "Electric signal bell." W. E. Simmonds. April 19th, 1932. (388950.)

12612. "Means for compensating for the inductance of a conductor." International General Electric Co., Inc. May 2nd, 1931. (388954.)

14536. "Method of preventing deterioration of the insulating oil in oil-cooled transformers and the like." S. E. Bowrey. May 23rd, 1932. (388969.)

15991. "Electric protective devices." British Thomson-Houston Co., Ltd. June 6th, 1931. (388975.)

16002. "Device for motor vehicles for automatically controlling the current produced by the dynamo of the vehicle." H. A. Plieger. June 6th, 1931. (388976.)

16569. "Mechanically relaying movement for telegraph and like signalling mechanism." Creed & Co., Ltd., and R. G. Griffith. September 3rd, 1931. (Divided application on 388785.) (388825.)

20296. "Electric dry battery cell." S. Apostoloff. July 18th, 1931. (388995.)

20891. "Float-operated electrical meters." Electrofio Meters Co., Ltd., and B. Dunglinson. July 25th, 1932. (388999.)

21465. "Electric cable connectors." J. S. Withers (Expanding Battery Post Co., Inc.). July 29th, 1932. (389002.)

21496. "Alternating-current signalling apparatus." Naamlooze Vennootschap Machinerieen-en Apparatenfabrieken. September 18th, 1931. (389003.)

23096. "Insulating roller for electric leads." W. Sihn, Jun. June 25th, 1932. (389010.)

25078. "Electric heating apparatus for waving or curling the hair." M. Coda. September 8th, 1932. (389016.)

26165. "Electric lighting installations." Naamlooze Vennootschap Philips' Gloeilampenfabrieken. December 1st, 1931. (389025.)

26291. "Superheterodyne receiver for wireless signalling." Hazeltine Corporation. February 13th, 1931. (Divided application on 32329/31.) (389026.)

29580. "Secret combination electric switches for preventing unauthorized use of motor vehicles." J. A. Witherinton Perkins. October 22nd, 1932. (389040.)

33675. "Modulated carrier wave receivers for use in secret signalling systems." Telefunken Ges. für Drahtlose Telegraphie. November 26th, 1931. (389051.)

35930. "Single-phase induction motors." English Electric Co., Ltd., L. Roberts, and R. D. Ball. April 27th, 1932. (Divided application on 12152/32.) (389056.)

36128. "Electric tumbler switches." International General Electric Co., Inc. December 24th, 1931. (389058.)

Trade Mark Applications

The following are among the recent applications for British trade marks. Objections against any of the proposed marks may be entered within one month from March 22nd:—

Trusync. No. 537234. Class 8. Apparatus embodying electromagnetic devices or electro-magnetic devices in combination with light sensitive cells used for the remote control of sound reproducing machines for synchronising purposes.—John Compton Organ Co., Ltd., Chase Road, North Acton, N.W.10.

Hobut. No. 539300. Class 8. Electrical measuring instruments.—Howard Butler, Ltd., Crown Works, Lincoln Road, Walsall.

Epalite. No. 538853. Class 13. Lamp reflectors of ordinary metal.—A. E. Williams, 84, Vyse Street, Birmingham.

Marmorlux. No. 536157. Class 16. Bowls, vases and shades, for use in connection with electric lighting and made of porcelain or earthenware.—Gregson Manufacturing Co., Ltd., 36, Tenby Street, Birmingham.

S.V. Co. (lettering and design). No. 539032. Class 50. Electric insulating varnishes and compositions.—Sterling Varnish Co., Fraser Road, Trafford Park, Manchester.

New Work for Contractors

Particulars of new works and building schemes for the use of electrical installation contractors and traders

Publication in this list is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Appleby (LINCS).—Re-erection of Appleby Hall (mansion) for the Hon. C. Winn.

Ashby-de-la-Zouch.—Houses (50); Barker & Son, builders, Loughborough.

Aylesbury (BUCKS).—Houses (68), Bicester Road, for Collcutt & Hamp.

Banbury.—Branch premises, High Street and Butcher's Row, for Montague Burton, Ltd.; H. Wilson, architect, 81, North Lane, Roundhay, Leeds.

Birkenhead.—Twenty shops and houses, Woodchurch Road; A. H. Boulton.

Birmingham.—Shops, Fox Hollies Road and Hartfield Crescent, Olton; Thompson & Co., builders, 202, Stratford Road, Sparkhill.

Blackpool.—Estate development, Ellesmere Road; C. Harding & Sons. Development of Knowle Estate; Hindle & Waterhouse.

Bournemouth.—Isolation hospital, Wallisdown; borough engineer. Hotel, Pine Grange site, Bath Road; Modern Service Flats, Ltd.

Brockham (SURREY).—Estate development, Middle Street; G. J. Arthur & Sons.

Bromley (KENT).—Houses (40) and shops (20); T. Spencer Bright.

Chesterfield.—Houses (142), Staveley; R.D.C. surveyor.

Chorlton-cum-Hardy.—Cinema for the proprietors of the Chorlton Market Hall (electrical installation); A. Winstanley, architect, 15, Great Ducie Street, Manchester.

Clacton-on-Sea.—Cinema, with electrical work (£30,000); G. H. B. Gould, architect, Station Road.

Cobham (SURREY).—Cinema, Between Street; Riley & Glanfield, architects, 6, Raymond Buildings, Gray's Inn, W.C.1.

Coulsdon.—Six shops, Coulsdon Road; F. A. Freeman.

Coventry.—Houses (60), Evelyn Avenue; Philpot Bros., builders, 117, Much Park Street.

Crowborough.—Hospital extensions (£3,787); Connor Bros., builders.

Derby.—Church and schools, Spondon (£6,000), for the Methodist trustees; secretary.

Dunfermline.—Extensions, Carnegie Institute; J. W. Ormiston, secretary, Carnegie Dunfermline Trust.

Dunoon.—Improvements scheme, including swimming pool (£40,000); burgh surveyor.

Durham.—Alterations, Burnopfield Council School; F. Willey, county architect, 34, Old Elvet.

East Lothian.—School, Prestonpans (£20,000); clerk, Education Committee, Haddington.

East Sussex.—Central clinic, Bexhill-on-Sea (£3,000), for C.C.; clerk, Lewes.

Edinburgh.—Houses (20), Corstorphine; J. Miller, builder, 88, Hanover Street. Houses, Sleigh Drive; E. J. MacRae, city architect.

Essex.—Extensions, Romford Institution (£8,075); J. Stuart, county architect, Chelmsford.

Failsworth (LANCS).—Houses (96), Bardsley Fold Farm Estate, for H. W. & G. T. Froggatt.

Fleetwood.—Infants' school (328 places), Manor Road and Mersey Road (£10,500), for E.C.

Gateshead-on-Tyne.—Conversion of Coronation Buildings, High Street, into public library; F. H. Patterson, borough engineer. Houses (100), Saltwell Road; F. W. Hindmarsh, builder, Gosforth, Newcastle. Extensions to premises of the Northern Cast Stone Co., Ltd., South Shore Road.

Gatwick (SURREY).—Aerodrome, for the Redwing Aircraft Co., Ltd.

Glamis (ANGUS).—Parish church; Geo. Bennett Mitchell, architect, 1, West Craibstone Street, Aberdeen.

Glasgow.—Houses (160), Newlands; Whyte & Galloway, architects, 121, Bath Street. Shops and houses for the Glasgow Estates Development Co., Ltd.; Mr. McDonald, architect, 13, East Kilbride Road, Burnside.

Gloucester.—Holy Trinity Church, Wotton St. Mary Without (£12,000); Rev. F. H. Charles, vicar.

Gravesend.—Shops and houses, Singlewell Road; L. F. L. Bridgland, architect.

Great Yarmouth.—Cinema; Olley & Haward, architects, 5, Queen Street.

Hanley (STAFFS).—Shop and offices adjoining the Palace Cinema, Lichfield Street; C. Cornes & Son, builders, Lichfield Street.

Herne Bay.—Alterations, Connaught Hotel; Foster & Barber.

Horley (SURREY).—Houses (22), Brighton Road, for C. D. Wellicome, Redhill. Bank, Victoria Road, for Barclays Bank, Ltd., London.

Huntingdon.—Cinema, High Street (£12,000); F. Burdett Ward, architect, 8, South Brink, Wisbech.

Inverness.—Houses; R. Pert & Sons, builders, 83, Bridge Street, Montrose.

Irish Free State.—(CASHEL, Co. TIPPERARY).—Houses (66); J. Connolly, architect. (YOUGHAL, Co. CORK).—Houses (20), Sea View and Gasworks field sites; H. T. Spreadborough, town surveyor, Town Hall.

Kettering.—Cinema, Montague Street (electrical installation); H. G. Bradley & D. Clarke, architects, 10A, Temple Row, Birmingham.

Lanchester.—Houses (96), various sites; E. Simpkin, R.D.C. surveyor, Council Offices.

Leeds.—Houses for the Public Utility Society; Miss M. Gough, secretary, Dunearn, Wood Lane, Headingley. Extensions, Leeds University; W. Airey & Co., Ltd., builders.

Leek (STAFFS).—Houses, North Street, Ball Green; Mr. Clarke, architect, Norton.

Leicester.—Conversion of Olympia Theatre, Marlboro' Square, Coalville, into a cinema; H. Robinson, architect, 6, Cherry Street, Birmingham. Reconstruction of Corn Exchange (£12,000); city architect.

Liverpool.—Extensions, Factory Premises, Woolton Road; W. A. Lowry, architect, 41, Arcade Buildings. Reconstruction of branch premises, Fenwick Street, for the National Provincial Bank, Ltd.; F. C. R. Palmer, architect.

London.—(BERMONDSEY).—Fifteen cottages, Crosby Row area (£7,900); Works Department. (BOW).—Extensions, poor law institution (£4,819); J. C. Mather & Son. (POPLAR).—Extensions, Methodist Church, East India Dock Road; G. Parker & Sons, Ltd. (ST. PANCRAS).—Flats (64), Leighton Road (£29,397); Gee, Walker & Slater, Ltd. (STOKE NEWINGTON).—Shops, Green Lanes and Seven Sisters Road; Dowton & Co. Tenements, Lordship Road; borough engineer. (WOOD GREEN).—Motor coach station, Lordship Lane, for Orange Luxury Coaches (Portsmouth), Ltd.; Crickmay & Shenstone. (LEWISHAM).—Three shops, Devonport Road; Walker, Clinging & Co. (SOUTHGATE).—Houses (62), Greenway; C. E. Hartshorne. Houses (54), Wentworth Gardens; J. Neilson. Cinema and 15 shops, Bowes Road; W. J. King.

Lossiemouth.—Reconstruction of church; G. Bennett Mitchell & Son, architects, Aberdeen.

Manchester.—Offices, Wilmslow Road and Hardman Street, Didsbury, for the Manchester Collieries, Ltd. (electrical installations); W. T. Gunson & Son, architects, 10, Marsden Street.

Mansfield.—Houses (38), Lichfield Avenue Estate; H. Baggaley, Ltd.

Merton and Morden.—Extensions, pumping station; G. Jerram, U.D.C. surveyor.

Mexborough (YORKS).—Extensions, including new wards, Montagu Hospital; D. W. Harrop, architect, 31, Bank Street.

Newbury.—Houses (20), Council Estate; borough engineer.

Newcastle-on-Tyne.—New six-storey sorting office for the post office (£100,000); E. N. Tweddle, Ltd., builders, Osborne Road, West Hartlepool.

Newton Mearns (RENFREWSHIRE).—Houses (46); D. Paul, 12, Wedderlea Drive, Cardonald, Glasgow.

North Riding.—School, Eston; county director of education, Northallerton.

Paignton.—Additions, Victoria Street; F. W. Woolworth & Co., Ltd.

Penrith.—Houses (24), Castle Hill Estate (£6,828); J. Laing & Son, Ltd. Cinema; G. H. Fawcett, architect, 3, York Place, Scarborough.

Prescot.—Sewage disposal works; H. B. Ward, civil engineer, 26, North John Street, Liverpool.

Preston.—Houses (99), Ribbleton; borough surveyor. Houses (41), Frenchwood; P. A. Bains & Son, builders.

Purley.—Eleven shops, High Street; Hooker & Rogers.

Rawtenstall.—Modernisation of Palace Theatre; Ball Bros. (Entertainments), Ltd.

Rugby.—Extensions to premises of the Rugby Industrial and Provident Co-operative Society, Ltd., 45, Chapel Street; Society's architects' department.

Smethwick.—Factory, Dartmouth Road; Dartmouth Auto Castings, Co., Ltd. Works extensions, Rook End Road; Midland Cattle Products, Ltd.

Solihull.—Central fire station (£3,013); surveyor.

South Shields.—News theatre, Ocean Road, for G. Bolam, Sunderland; J. H. Morton & Sons, architects, Fowler Street. Senior school for E.C.; H. Hill, architect, 10, Winchester Street. Alterations to St. Mark's C.O.E. Schools for E.C.

Stockport.—Houses (31), Cheadle Heath; W. F. Gardner, borough surveyor.

Stockton-on-Tees.—Extensions to F. Newman's premises, Dovecot Street; G. P. Stainsby, architect, 25, High Street.

Stoke-on-Trent.—Baths, works dept. site; city engineer. Development of Blurton Green Farm Estate; C. W. V. Ball.

Sunderland.—Houses (140), Gabriel Estate; G. T. Brown, architect, 51, Fawcett Street.

Swinton (LANCS).—Re-erection of works, Swinton Hall Road, for D. Barker & Sons (£10,000).

Taunton (SOMERSET).—Offices for County Council.

Thornton Cleveleys.—Cinema, Victoria Road, Cleveleys, for W. Livesey (electrical installation); G. E. Tonge, architect. National Provincial Bank Chambers, 367, Lord Street, Southport.

Torquay.—Extensions, G.P.O.; H.M. Office of Works, King Charles Street, S.W.1.

Tunstall.—Works extension, Pinnox Street; W. Sylvester, Ltd.

Tynemouth.—Houses (136), Broadway and Mast Lane Estates; A. E. Brannen, Ltd., builders, North Shields.

Wallingford.—Houses (30), Didcot; R.D.C. surveyor.

Walsall.—Houses (89), Profitt Street (£23,595); Dickinson & Holford, Ltd. Rebuilding St. George Hotel, Digbeth (£48,000); J. Taylor, borough surveyor, Council House.

Warrington.—Houses (60), Bewsey Estate; borough engineer.

Warwickshire.—Domestic subjects' centre, Stratford-on-Avon, for County E.C.; director of education, Leamington Spa.

Watford.—Public offices (£11,000); W. W. Newman, borough engineer.

Weetslade (NORTHUMBERLAND).—Houses (30) and two shops at Annitsford; F. E. Maughan, builder, Dudley.

Wellington (SALOP).—Houses (30); Pursehouse & Gregory, builders, Wednesfield.

West Hartlepool.—Houses (31), various sites, for Harland & Parker, builders, 202, York Road.

Wolverhampton.—Block of 14 shops, showrooms and offices (£40,000), Victoria Street; Horton's Estate, Ltd., Colmore Row, Birmingham.

Wrexham.—Houses (250), Spring Lodge site; borough surveyor.